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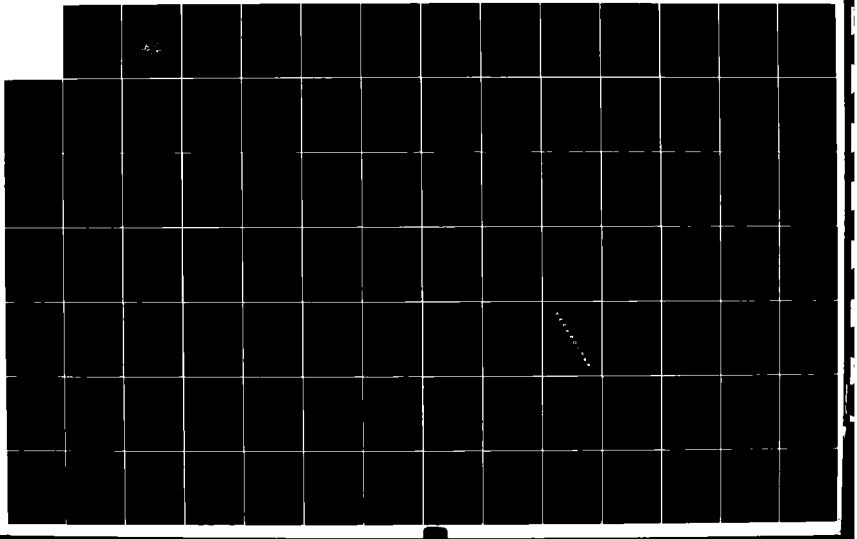

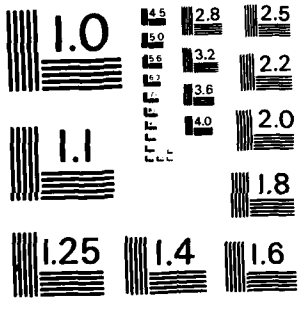

DETAILED PROJECT REPORT

AND

ENVIRONMENTAL ASSESSMENT

WILSON BRANCH

CHESTERFIELD COUNTY, S. C.

SECTION 205 OF THE 1948 FLOOD CONTROL ACT AS AMENDED

U. S. ARMY CORPS OF ENGINEERS
CHARLESTON, SOUTH CAROLINA, DISTRICT
ENGINEERING DIVISION, PLANNING AND REPORT BRANCH

JUNE 1982

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WILSON BRANCH BASIN
CHESTERFIELD COUNTY, SOUTH CAROLINA

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SYLLABUS

The purpose of this study was to investigate flood problems associated with high flows from Wilson Branch, Chesterfield County, South Carolina, and the overflow of the great Pee Dee River. It was conducted in response to a request by the Town of Cheraw, S.C. The study area is confined to a 1,500 foot reach of Wilson Branch located between points 500 and 2,000 feet upstream from the confluence with Huckleberry Branch.

Flood waters from Wilson Branch result in average equivalent damages estimated at $35,390 annually to existing development. An array of potential measures to alleviate flood damages were formulated and evaluated in an effort to determine the most feasible alternative. After evaluation of all impacts resulting from implementation of alternatives, a nonstructural alternative consisting of removing five houses from the flood plain was selected as the best plan to meet the needs of the area. These houses would be sold for salvage.

Alternative plans formulated during the planning process were evaluated based on the prevailing interest rate of 7 5/8%. The estimated cost for implementation of the recommended plan is $368,870. The Federal share of this expenditure is $295,100, which includes $80,000 for associated non-project cost required for personal relocation expenses. The non-Federal share is $73,770 including $20,000 for personal relocation expenses. Average annual project costs are estimated to be $21,040. When compared to annual benefits of $25,220, the resultant benefit-to-cost ratio is 1.20 to 1.

WILSON BRANCH
CHESTERFIELD COUNTY, SOUTH CAROLINA
DETAILED PROJECT REPORT

INTRODUCTION

The purpose of this study, the results of which are presented in this Detailed Project Report, was to determine the needs of the Wilson Branch Basin, for flood control and related water resource development. Inherent in the investigation was the development of the most suitable plan for alleviating these problems. The organization and format of this report is in compliance with established planning regulations. It consists of a main report designed to fully support the essential analyses and conclusions of the study, to support the study recommendations, and to enable reviewers to understand the rationale for the conclusions and recommendations. Detailed analyses relevant to the conclusions derived from the economic, environmental, social and engineering studies are contained in the appendixes which supplement the main report.

AUTHORITY

The study and report are in compliance with Section 205 of the Flood Control Act of 1948 as amended by the Water Resources Development Acts of 1974 and 1976. The referenced act provides authority to the Chief of Engineers to construct small flood control projects that have not been specifically authorized by Congress. Each project must be complete within itself and economically justified. In addition, the project is limited to a Federal cost of not more than $4,000,000. Federal cost limitations include all project costs for investigations, inspections, engineering, preparation of plans and specifications, supervision and administration, and Federal share of construction costs. Study of flood problems in the Wilson Branch basin was requested by letter from the City of Cheraw dated 13 June 1979. A copy of this letter is included in Appendix 3 to this report.

Purpose and Scope

A project planned and constructed under Secton 205 authority is designed to provide the same complete project, the same adequate degree of protection and the same environmentally compatible project as would be provided under specific Congressional authorization. Flood control projects under Section 205 are not limited to any specific flood control alternative and the objective of reducing flood damage may be accomplished by either taking measures to modify the flood or modify human and property susceptibility to flood damages. Flood control projects under Section 205 may also include features for other water resource purposes, provided local interests indicate the need as well as their willingness and ability to contribute that portion of project cost related to purposes other than flood control.

The studies in this report are for that portion of the basin which affect the residential, commercial and governmental development in Town of Cheraw, South Carolina. Studies were concentrated on flood problems and the potential flood control alternatives. All reasonable plans to solve the area's flood problems were considered and several of these plans were studied in detail including cost and benefit and environmental impact analyses. The selection of the most feasible plan was made after considering all factors, including those expressed by concerned agencies and local interests. The studies of various alternatives were made in sufficient detail to permit plan selection.

Participants and Coordination

The Charleston District, Corps of Engineers, had the principle responsibility for conducting and coordinating this study. The study was requested by Town of Cheraw, South Carolina, which cooperated throughout the entire study process. Coordination with various Federal, State and local agencies was made throughout the study. Pertinent comments received are discussed in the section of this report entitled "Summary of Coordination, Public views and comments."

Coordination with local government and affected individuals was conducted by the use of informal "workshop" type sessions. Results of study investigations were presented to Town Council at a special meeting held on 29 April 1982. A second meeting was held on 20 May 1982 for the purpose of discussing proposed improvements with Town Council and affected property owners. Memorandums of these meetings are included in Appendix 3.

Prior Studies, Reports, and Existing Projects

The Charleston District, Corps of Engineers, prepared a reconnaissance report on Wilson Branch, Cheraw, South Carolina, dated 25 June 1980, which recommended that a detailed study be made under authority of Section 205 of the Flood Control Act of 1948, as amended. A Flood Insurance Study was made for the Flood Insurance Administration by the U.S. Geologic Survey (USGS) in March 1978. No other reports have been prepared. There are no existing projects on Wilson Branch.

The Report and Study Process

The organization and content of this report is in general compliance with instructions contained in Engineering Regulation ER 1105-2-60, and other related guidance. In summary, the report consists of a main report designed to fully support the analyses and conclusions of the study; to support the recommendations; and to enable reviewers to understand the rationale for the conclusions and recommendations. Detailed analyses relevant to the conclusions derived in the main report are contained in supportive appendices which supplement the main report.

Feasibility studies were conducted consistent with the planning requirements of the Water Resource Council. An interdisciplinary planning team was utilized to address four functional planning tasks of problem identification, formulation of alternatives, impact assessment, and evaluation.

In general, the planning process consisted of the refinement of a large number of alternatives down to a few detailed plans and eventually to a recommended solution. During the planning process, the number of plans decreased while the level of detail at which they are examined increased.

The three basic planning stages were:

Stage 1, Delineation of Strategies. Efforts during Stage 1 centered on the identification of problems and needs in the study area, establishment of broad planning objectives, definition of public concerns, and formulation of a management program for conduct of the study;

Stage 2, Formulation of Alternatives. The planners and engineers performed the bulk of their work in Stage 2. Included in this stage were the detailed investigations of such factors as hydrology, hydraulics, costs, structural designs, and institutional analyses. Detailed environmental assessments and socio-economic studies were also accomplished. Stage 2 work eliminated non-viable plans, and formulated a limited number of alternatives which were carried forward in Stage 3;

Stage 3 Refinement of Plans. Stage 3 included the necessary refinement of plans and designs based on economic, engineering, environmental, and social concerns identified during the review at the conclusion of Stage 2. Emphasis placed on a more thorough evaluation of these plans and the necessary arrangements for implementation.

NATIONAL OBJECTIVES

Federal Water resource planning guidelines require that Federal and Federally-assisted water and related land resource planning be directed to address National Economic Development (NED) and Environmental Quality (EQ) as national objectives. NED is to be achieved by increasing the value of the nation's output of goods and services and improving national economic efficiency. The selection of an NED plan is achieved by maximizing net economic returns, The NED plan accomplishes the stated study objectives in a more economical manner than any other means of accomplishing these objectives. In order to be considered economically viable, a NED plan must have a benefit-to-cost ratio of at least 1.0 to 1. The benefit-to-cost ratio is a comparison of expected benefits to projected NED costs.

EQ enhancement would be achieved by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural cultural resources and ecological systems.

In addition to the above, the impacts of proposed actions on the Regional Economic Development (RED) and Other Social Effects (OSE) were evaluated. Contributions to the RED account are established by measuring a proposal's effect on a region's income, employment, population, economic base, environment, and social development. Contributions to the OSE account are determined by establishing a proposal's effects on real income, security of life, health and safety, education, cultural and recreatonal opportunities, and other factors.

PLAN FORMULATION

Environmental Setting and Natural Resources

The Town of Cheraw is located in Chesterfield County in northeastern South Carolina adjacent to the Pee Dee River. Cheraw is located 61 miles southeast of Charlotte, North Carolina and 75 miles northeast of Columbia, South Carolina. The town is basically residential except for a downtown area consisting of small businesses and some small industrial plants. Wilson Branch lies almost entirely within the corporate limits of Cheraw. It flows in a generally northeast direction to its confluence with Huckleberry Branch, the northern town limit, then to the Pee Dee River approximately 1 3/4 miles away. Its drainage area above its confluence with Huckleberry Branch is 2.37 square miles. (See Plate 1.) The study area is confined to a 1,500-foot reach of Wilson Branch located between points 500 and 2,000 feet upstream from the confluence with Huckleberry Branch. (See Plate 2.) Only eleven houses are adversely affected by flooding. They are all located within 150 feet of the branch along Huckleberry Lane, Park Drive, Sliding Hill Road and Poplar Street. Five houses are less than 50 feet from the branch.

Cheraw has mild winters and hot summers. Temperatures drop below freezing on about 70 days during the year but rarely reach 0^{o}F. Temperatures reach 90^{o} on about 90 days during the year. The area receives about 47 inches of precipitation per year.

The area surrounding Cheraw is hilly with an average elevation of 150 feet National Geodetic Vertical Datum (NGVD). It is dissected by small drainage basins such as Wilson Branch and Huckleberry Branch. Soils in Cheraw are of the Norfolk-Gilead-Rutledge association. The well drained Norfolk soils represent 40 percent of the association and are on the highest ridges. Surface layers are gray loamy sand, 18 to 30 inches thick. Gilead soils, comprising about 25 percent, are on the lower ridges and the gentler side slopes. They have light gray to gray loamy sand surface layers. Subsoils are brownish-yellow, compact sandy clay loam or sandy clay. The wet Rutledge soils, comprising about 20 percent, are in the oval-shaped upland depressons and along the poorly drained stream channels. Surface layers are black loamy sands, high in organic matter, and subsoils are gray loamy sands, usually saturated with water.

Wilson Branch lies within the Yadkin-Pee Dee River Basin. It is a relatively short stream approximately two miles in length, with headwaters originating on the west side of the Town of Cheraw. Originating as an intermittent stream at the headwater, it develops into a perennial stream prior to its confluence with Huckleberry Branch. Normally the stream is narrow and shallow.

Water quality has decreased in recent years partly as a result of rapid residential growth along the stream. The State of South Carolina has classified Wilson Branch as class B waters. Class B waters are described as waters suitable for domestic supply after complete treatment in accordance with requirements of the South Carolina State Board of Health. Class B waters are also suitable for propagation of fish, industrial and agricultural uses and other uses requiring water of lesser quality. The Town of Cheraw draws its water directly from the Pee Dee River. Although water treatment is required, the source is more than ample for the future.

Cheraw is a small town bordered by expansive farm lands. Wilson Branch is a tributary of Huckleberry Branch which is in turn a tributary of the Pee Dee River. Flooding in Wilson Branch stems either from direct runoff, Pee Dee River backwater, or a combination of both sources. A brief description of flora, fauna and cultural resources in the study area follows:

a. Flora. Vegetation occurring within the study area is typical of Southern Coastal Plain flora.

(1) Overstory species predominating include:

Sweet gum	Sugarberry	Water Oak
Black gum	Loblolly Pine	Willow Oak
Yellow Poplar	Longleaf Pine	

(2) Understory and ground cover species predominating include:

Dogwood	Poison Ivy	Plantains
Privet	Virginia Creeper	Potentillas
Honeysuckle	Rushes	

b. Wildlife. All wildlife species which occur in a typical residential, upper coastal plain stream bottom land habitat can be expected to occur in the Wilson Branch study area.

c. Fish. Wilson Branch is a shallow narrow stream and does not support a significant fishery. The stream bottom consists of a silty-gravel base.

d. Threatened and Endangered Species. There is no critical habitat for any endangered or threatened species. Furthermore, there does not appear to be any potential for adversely affecting any endangered or threatened species.

e. Cultural Resources. The National Register of Historic Sites lists two sites which occur within Cheraw. The sites include (1) Cheraw Historic District and (2) St. David's Episcopal Church and Cemetery. The lower reaches of Wilson Branch, involved in the study area, are outside of the historic sites. Additionally the reconnaissance survey did not reveal any significant cultural resources not on the National Register.

Human Resources

The major center of population, which affects the future growth of Wilson Branch Basin is the Town of Cheraw in Chesterfield County. A large portion of the town lies within the basin limits.

Data for Chesterfield County is considered to be indicative of the basin area. The population of Chesterfield County has increased from 33,667 in 1970 to 38,161 in 1980 which represents a combined growth rate of 1.3 percent per year. The following tabulation shows 1980 population characteristics of Chesterfield County as compared with the State of South Carolina.

TABLE 1

POPULATION CHARACTERISTICS

	Chesterfield County	South Carolina
1980 Population	38,161	3,119,208
Median school years completed	9.3	10.5
Employment - Nonagricultural		
Percent in manufacturing industry	51.4	36.2
Percent in white collar occupation	27.3	37.3
Percent government workers	9.2	14.7
Median income for families	$14,940	$16,509

Data on employed civilian workers by occupational group are available from the 1970 Census of Population. The largest group of workers in Chesterfield County was in nonagricultural employment. Of this group 51.4 percent were in manufacturing related employment. Wholesale and retail trade make up 12.5 percent of the group.

DEVELOPMENT AND ECONOMY

The principle economic center of the Wilson Branch Basin is the Town of Cheraw. Growth of the basin is expected to continue based on past trends.

As shown in the U.S. Department of Commerce publication, Summary of Projections, Economic Activities in the Southeastern States, published in October 1976, the population of the Town of Cheraw is expected to increase slightly from 5,654 in 1980 to 5,770 by the year 2020. This represents a growth rate of .05 percent per year as compared to a predicted growth rate of .6 percent per year for the State of South Carolina and .14 percent for Chesterfield County. Population projections for Town of Cheraw, Chesterfield County and the State of South Carolina are shown in the following tabulation.

TABLE 2

POPULATION TRENDS

	1980	1990	2000	2010	2020
Cheraw	5,654	5,680	5,710	5,740	5,770
Chesterfield County	38,161	39,100	40,100	40,300	40,400
State of South Carolina	3,119,208	3,368,200	3,672,000	3,865,100	4,011,600

The level of civilian employment depends upon the number of civilians in the labor force who are successful in finding work. Employment projections presented in this report were obtained from OBERS projections published for Chesterfield County. The following tabulation shows projected employment trends.

TABLE 3

EMPLOYMENT TRENDS
CHESTERFIELD COUNTY, S.C.

	1980	1990	2000	2010	2020
Population	38,161	39,100	40,100	40,300	40,400
Total Employment	17,140[1/]	17,600	18,000	18,100	18,200
Employment-Population ratio	.45	.45	.45	.45	.45

[1/] Estimated from 1979 total employment in South Carolina Security Commission, South Carolina Manpower in Industry, August 1980.

Future income estimates for Chesterfield County were obtained from the October 1976 OBERS projections for the southeastern states and are considered indicative of the Wilson Branch Basin. The following tabulation shows projected per capita income for Chesterfield County and for South Carolina. Information in the following tabulation is based on 1967 dollars.

TABLE 4

INCOME TRENDS

	1980	1990	2000	2010	2020
			Chesterfield County[1/]		
Estimated Per Capita Income (1967 $)	2,961	3,945	5,308	7,176	9,317
Per Capita Income Relative (U.S. = 1.00)	.62	.64	.65	.67	.70
			South Carolina[1/]		
Estimated Per Capita Income (1967 $)	3,679	4,861	6,576	8,804	11,109
Per Capital Income Relative (U.S. = 1.00)	.77	.79	.81	.82	.84

TRANSPORTATION

The City of Cheraw is crossed by State Highway 9 and U.S. Highways 1 and 52. Seaboard Coast Line Railroad has a couple of lines which pass through Cheraw.

LAND USE

In the Wilson Branch Basin, land use by man is the strongest factor in determining the condition of natural resources. Much of the basin is residential with some industrial sites located upstream. The large per-

1/U.S. Department of Commerce, Bureau of Economic Analysis, Summary of Projections, U.S. Army Corps of Engineers, South Atlantic Division, October 1976.

centage of underdeveloped land, with some improvements already scheduled, mean additional future flooding problems for the downstream reaches. Between 1960 and 1970 Chesterfield County had an increase of 12 percent in housing units. This growth pattern continued in the 1970's.

Problems and Opportunities

The problems and opportunities of the Wilson Branch Basin are related to flood damages that occur to residential development in the flood plain area and opportunities of eliminating these damages while converting the flood plain to a more environmentally oriented use. The focal point of this study is on the flooding that occurs in the residential area along the lower reach of Wilson Branch. Floods result from backwater conditions caused by constrictions, inadequate channel capacity to carry storm discharges, and backwater from the Pee Dee River. In July 1969, August 1970, and June 1979, flood waters on Wilson Branch exceeded channel capacity and resulted in the flooding of residential structures.

Flood Damages

Flood damages within the Wilson Branch Basin consist of both tangible and intangible damages. Tangible damages are those subject to monetary evaluation and include: physical damages or losses to property and improvements; emergency cost for flood damage prevention; and business, financial and wage losses in and adjacent to flood prone areas. Intangible damages are not susceptible to monetary evaluation and include: danger to human life; added inconvenience and human discomfort; injury and exposure during floods; creation of conditions detrimental to health and security; interruption of traffic, utility services and normal community activities; and the detrimental effects of frequent flooding on the appearances and aesthetic quality of the flood plain such as deposition of debris, etc.

In order to compute economic damages, detailed field surveys were conducted to evaluate structures within the flood plain limits of Wilson Branch. Flood damage computations consisted of the creation of a logical relationship between flood frequencies, flood stages and flood damages. A computer program for the Economic Analysis of Flood Control Alternatives was utilized for computing existing and future flood damages. This program was developed by Corps of Engineers personnel of the South Atlantic Division. It is basically a damage calculation program with

added options to permit formulation of various plans of improvement based on either structural or nonstructural measures for flood damage reduction.

The program analyses individual buildings to determine the expected depth of flooding for various flood events with selected recurrence intervals. Based on the expected depth of flooding in relation to the first floor elevation, an expected damage to the building and its contents was computed utilizing data for the type of building, its value, and predetermined depth-damage relationships. Individual events were combined through the use of probability analysis to provide the average annual damage that would be expected for each building.

Potential flood problems in the Wilson Branch Basin occur along Huckleberry Lane, Park Drive, Sliding Hill Road and Poplar Street (See Plate 2). Flooding in this area has been frequent and can be expected to become even more frequent and severe as basin development continues. Table 5 shows the number of houses in the various flood plains for a 1500-foot reach upstream of the bridge at Huckleberry Lane. Houses are assigned to a particular flood plain on the basis of their first floor elevation. Plate 3 graphically dipicts first floor elevations of affected structures in relation to flood stages.

TABLE 5

SUMMARY OF FLOOD PLAIN STRUCTURES
NUMBER OF HOUSES IN FLOOD PLAIN

Flood Plain	Huckleberry Lane	Sliding Hill Road	Park Drive	Poplar Street	Total
10-Year	3	2	0	0	5
25-Year	3	3	2	0	8
50-Year	3	3	2	0	8
100-Year	3	3	3	0	9
500-Year	4	3	3	1	11
SPF	4	3	3	1	11

The amount of monetary damages resulting from a flood is related to the depth experienced. As flood depths increase, resulting flood damages increase. Flood events are defined by their expected frequency of occurrence (i.e., a 2-year frequency flood would occur on the average of once every two years with a 50% probability of occuring during any given year). Table 6 illustrates damages expected to occur in the Wilson Branch Watershed by flood frequency event.

TABLE 6
PROJECTED FLOOD DAMAGES - EXISTING CONDITIONS

Flood Frequency	Resulting Damages (1981 Dollars)
2-year	$ 12,500
10-year	77,600
50-year	192,500
100-year	272,400
500-year	375,900
SPF	414,800

Table 7 shows the equivalent average annual damages which may be expected to occur for the selected 50-year period of analysis. These damages were derived by discounting procedures at a 7 5/8% interest rate and 1981 dollar values. Damages and benefits for alternatives are carried into Stage 3 of the planning process by discounting at a rate of 7 5/8%. These calculations are tabulated in subsequent sections of this report. Average annual damages are shown for structures, contents and other additional property (i.e., yards, fences and outbuildings).

TABLE 7
AVERAGE ANNUAL DAMAGES
EXISTING CONDITIONS - WITHOUT AFFLUENCE

Type of Damage	Average Annual Damages - Without Affluence
Residential Structural	$19,870
Residential Contents	9,330
Residential Additional	2,670
Total Annual Damages	$31,860

RECREATION

Recreation in Cheraw is mostly in the form of small parks and historic sites.

Future Conditions

If no Federal action is taken, the situation which poses a serious threat to the health and safety of local residents, will become more readily apparent. Rapid growth of areas, such as this, tends to worsen problems unless corrective and/or preventative measures are taken. The City of Cheraw is taking measures to control or alleviate problems from future development in the flood plain. These measures include admission of Cheraw into the Flood Insurance Program. Detailed flood plain mapping has been available since March 1978. Information provided by this mapping will provide sufficient data to implement and enforce regulatory flood plain measures.

As development of the basin continues, open areas and wood areas are being replaced with residential and commercial development which results in increased runoff rates from local storms. Development plans have already been formulated for major portions of the basin's remaining undeveloped land, and in some areas new subdivisions are in the early stages of development. Hence, future flood damages can be expected to be more severe and occur more frequently.

Despite past and projected future development, hydrologic and hydraulic computations were made assuming present development of the basin as discussed in Appendix 3 of this report. This was done to minimize costs and time requirements. Due to the nonstructural nature of potential solutions discussed later in this report, detailed hydraulic design was not required. It was decided to use as much as possible of the data provided by the Flood Insurance Study.

The value of residential contents per unit is expected to increase over time with increases in affluence (an increase in per capita income in real terms). Increases in content values during the study period are projected on the basis of the anticipated growth in the residential per capita income of Chesterfield County, S. C. An indication of increased severity of future flood damages without affluence is shown in Table 7 by comparison with the existing flood damages with affluence shown in Table 8. The equivalent average annual damages were derived by discounting procedures for a 50-year period at 7 5/8% interest rate and 1981 dollar values.

TABLE 8
AVERAGE ANNUAL DAMAGES
EXISTING CONDITIONS - WITH AFFLUENCE

Type of Damage	Resulting Damage
Residential Structural	$19,870
Residenial Contents	12,850
Residential Additional	2,670
Total Damages	$ 35,390

Planning Constraints

Time is the principal planning constraint facing the Wilson Branch Detailed Project Report. With the passage of time, the probability increases for another damaging flood to occur.

Planning Objectives

In order to address the problems and needs of the concerned Cheraw residents within the planning constraints, planning objectives for the flood damage reduction study were established. The principal planning objective is to eliminate flooding danger to life and property by either structural or nonstructural measures. Other objectives of the study include: 1) maximizing the recreational benefits to be derived from a project; 2) minimizing adverse impacts on cultural resources; and 3) enhancing fish and wildlife in the area.

ALTERNATIVE PLANS

This task provides for developing alternative resource management systems that address planning objectives. To help insure that the best overall plan was developed, a range of alternative plans was formulated. The following sections describe the formulation process and describe the various plans formulated.

Management Measures

A variety of technical and institutional means exist for managing water resources of the Wilson Branch Basin. As a basis for formulating alternative plans, a broad range of these means was examined to identify those which could address the planning objectives. Both structural and

nonstructural means were given consideration. Management measures considered as part of these investigations included the following:

Channel Excavation
Bridge Modification
Levee Protection
Flood Plain-Demolition
Raising of Flood Plain Structures
Flood Insurance
Flood Plain Regulations
Flood Plain Zoning or Regulations
Flood Plain - Relocation

Plan Formulation Rationale

The primary objective of this investigation was the reduction of monetary flood damages to existing and future flood plain development. With this in mind, efforts were made to formulate alternatives which would be effective in either reducing flood stages or reducing the susceptibility of flood plain structures to flood conditions. This can be accomplished in one of two ways. Either by modifying the limits of flooding through structural alternatives or by modifying the affected structures through nonstructural alternatives.

The topography of the subject basin restricted the number of potential structural alternatives which could be considered. For example, due to the small size of the basin and backwater flooding from the Pee Dee River, there were no suitable sites for storing flood waters. Therefore, reservoir alternatives were deemed infeasible for consideration. Also clearing and snagging could be eliminated as a possible solution, since a visual inspection of the stream revealed that no significant amount of debris or vegetation was present. The only traditional structural measures which appeared implementable were channel and bridge modifications.

Alternatives for modifying the damage susceptability of flood plain structures also appeared worthy of detailed investigations. This type of alternative includes such measures as relocating, demolishing or raising affected flood plain structures. Nonstructural alternatives such as those listed above are also environmentally desirable.

Analysis of Plans Considered in Preliminary Planning (Stages 1 & 2)

In order to formulate alternative plans of action, the first step completed was the identification of high damage areas and the evaluation of flood damage potential in these areas. This was followed by an evaluation

of the causes of flooding. Basically, flood damages result from a combination of reasons. These include,the location of structures in areas subject to flooding; development of adjacent nonflood plain areas which resulted in increased storm runoff; the development of man-made constrictions in Wilson Branch and backwater flooding of the Pee Dee River.

Flood control alternatives investigated for Wilson Branch Basin in Stages 1 and 2 included a wide range of possibilities. As the studies progressed, some of the methods commonly used in flood control proved to be engineeringly unsound.

As previously mentioned, construction of levees and clearing operations were considered impractical. In addition, structural solutions such as bridge and channel modifications were eliminated from serious consideration because the severe and frequent backwater effects from the Pee Dee River would still cause flooding in the study reach. The only remaining solutions to the flood problems of Wilson Branch were nonstructural solutions.

Two types of nonstructural alterantives were considered in reducing damage on Wilson Branch. These alternatives included the purchase and demolition of existing flood plain structures and the purchase for future relocation of these structures and their contents. Flood proofing the flood plain structures by raising the first floor elevation was considered impractical since only the house is raised out of the flood plain. Flooding of other personal property and erosion would still continue. Also the houses below the 10-year flood plain would have to be raised about six feet which could ruin the aesthetics of the area. Nonstructural alternatives reduce flood damages by removing damagable properties from the flood plain and by restoring natural flood plain capacities.

The following pages describe the various nonstructural alternatives evaluated during Stages 1 and 2 of the planning process.

Flood Plain Demolition Alternatives

Flood plain demolition alternatives for Wilson Branch consisted of the purchase and demolition for salvage of all structures whose first floor elevation was located at or below the flood level of a specified flood. Plans were formulated for 2-, 4-, 8-, 10-, 25-, 50-, 100-year and Standard Project Floods. All structures involved in the implementation of a demolition alternative would be purchased at fair market value and provisions would be made to resettle occupants. Lands purchased during project implementation would be turned over to the local project sponsor for development in a manner compatible with flood plain use such as recreation facilities or environmental corridors. The following tabulation (Table 9)

summarizes the results of formulated flood plain demolition alternatives. Project first costs for demolition alternatives, if implemented, would be allocated in compliance with current cost-sharing procedures for local protection nonstructural alternatives, which require a 20% local and 80% Federal contribution. Associated costs required for the relocation of families and their belongings were not included in the cost analysis at this stage, in accordance with current policy.

TABLE 9

EVACUATION SUMMARY
MULTI-LEVEL PROTECTION ANALYSIS
($1,000)

Level	Residual Damage	Annual Benefits	INCR Benefits	Annual Cost	INCR Cost	NET Benefits	NET INCR Benefits	BRC	NUMBER OF Houses Evacuated
Existing	35.39								
2-Year	0.	0.	0.	0.	0.	0.	0.	0.	0
4-Year	21.93	11.95	11.96	8.85	8.85	3.11	3.11	1.35	2
8-Year	7.26	25.22	13.27	21.04	12.19	4.19	1.08	1.20	5
10-Year	7.26	25.22	0.	21.04	0.	4.19	0.	1.20	5
25-Year	1.00	30.61	5.39	33.83	12.80	-3.22	-7.41	0.90	8
50-Year	1.00	30.61	0.	33.83	0.	-3.22	0.	0.90	8
100-Year	0.34	31.19	0.58	38.83	5.00	-7.64	-4.42	0.80	9
SPF Year	0.	31.75	0.55	47.63	8.80	-16.89	-8.25	0.67	11

Although all demolition plans of 10-year frequency and below were economically justified, only the 10-year plan was carried forward into Stage 3. This plan was selected for Stage 3 evaluation because the ten-year protection is the recognized standard for local drainage projects. Also, there are no houses between the 10- and 20-year flood plain. After clearing these structures there would be no houses within the 20-year flood plain.

Flood Plain Relocation Alternatives

Flood plain relocation alternatives considered consisted of the purchase and physical relocation of all structures and their contents for which the first floor elevation was located at or below the flood level of a specified flood. Relocation plans were formulated for the 2-, 4-, 8-, 10-, 25-, 50-, 100-year and the Standard Project Floods. All structures involved in the implementation of a relocation plan would be purchased at fair market value and moved to new sites free from the hazard of flooding. Provisions would also be included for resettlement of occupants of the dwellings. Lands purchased during implementation would be turned over to the local project sponsor for development in a manner compatible with flood plain use such as recreation facilities or environmental corridors. Table 10 summarizes the results of formulated flood plain relocation alternatives.

Project first costs for relocation alternatives would be allocated in compliance with current cost sharing procedures for local protection nonstructural alternatives which require a 20% local and 80% Federal contribution. Associated costs required for the relocation of families and their belongings were not included in the cost analysis at this stage, in accordance with current policy.

TABLE 10

RELOCATION SUMMARY
MULTI-LEVEL PROTECTION ANALYSIS
($1,000)

Level	Residual Damage	Annual Benefits	INCR Benefits	Annual Cost	INCR Cost	NET Benefits	NET INCR Benefits	BRC	NUMBER OF Houses Evacuated
Existing	35.39								
			0.		0.		0.		
2-Year	0.	0.		0.		0.		0.	0
			20.34		17.79		2.56		
4-Year	21.93	20.34		17.79		2.56		1.14	2
			24.62		22.58		2.04		
8-Year	7.26	44.97		40.36		4.60		1.11	5
			0.		0.		0.		
10-Year	7.26	44.97		40.36		4.60		1.11	5
			17.16		24.18		-7.02		
25-Year	1.00	62.13		64.55		-2.42		0.96	8
			0.		0.		-0.		
50-Year	1.00	62.13		64.55		-2.42		0.96	8
			5.16		9.05		-3.89		
100-Year	0.34	67.28		73.59		-6.31		0.91	9
			8.54		16.45		-7.91		
1000-Year	0.	75.83		90.04		-14.22		0.84	11

Although all relocation plans of 10-year frequency and below were economically justified, only the 10-year plan was carried forward into Stage 3. This plan was selected for Stage 3 evaluation because ten-year protection is the recognized standard for local drainage projects. Also, there are no houses between the 10- and 20-year flood plain. After clearing these structures there will be no houses within the 20-year flood plain.

No Action Alternative

The final alternative considered during the preliminary planning process was a no action alternative. This alternative, if selected would recommend no Federal participation for corrective action in reducing flood damages. Essentially, conditions in the area would remain unchanged, unless individuals or local government flood damage reduction measures are implemented.

There would be no monetary benefits or costs associated with this alternative. Damage would be expected to continue to take place at a rate comparable to past experience and could possibly increase due to development within the watershed and to increases in the real value of structures and their contents. This alternative was carried through three planning stages since it represents a basic condition for evaluating the outputs of other alternatives.

FINAL ARRAY OF PLANS

During the Stage 3 phase of the feasibility study process, potential alternatives were further refined and reduced in number to obtain a reasonable array of fully implementable plans. Economic analysis of alternatives carried into Stage 3 of the planning process and presented in this and subsequent sections of this report, are based on the prevailing interest rate of 7 5/8% used during Stage 2 evaluations. Principal attention was given to the formulation, assessment, and evaluation tasks emphasized in Stage 3 to derive implementable plans. The conceptual alternatives considered earlier were developed into precise management programs composed of complete technical systems and institutional arrangements.

As a general guide, the alternatives carried through this stage processed the following characteristics:

(1) Each detailed plan processed an efficient and effective means for addressing the planning objectives.

(2) Each detailed plan was significantly different from other plans; that is, each alternative plan made a unique contribution to the planning objective not made by any of the other alternatives.

(3) Each detailed plan was "justified" in the sense that its total beneficial contribution (monetary and non-monetary) were equal to or exceeded its total adverse contributions (monetary and non-monetary).

Two potential plans of improvement and the "No Action" alternative were carried forward into Stage 3. These plans consisted of the 10-year flood plain demolition plan and the 10-year flood plain relocation plan. Pertinent fiscal data for each of the above listed alternatives is contained in Table 11. Detailed information for each of these plans is contained in the following sections and pertinent report appendices.

TABLE 11
SUMMARY OF STAGE 3 ALTERNATIVES

Plan Number	1	2	3
Plan Name	Demolition	Relocation	Do Nothing
Cost	$268,870	$515,950	-
Annual Cost	$ 21,040	$ 40,360	-
Annual Benefits	$ 25,220	$ 44,970	-
Benefit-to-Cost Ratio	1.20 to 1	1.11 to 1	-

10-YEAR FLOOD PLAIN DEMOLITION ALTERNATIVE (PLAN 1)

PLAN DESCRIPTION - DEMOLITION

The 10-year flood plain demolition alternative for Wilson Branch calls for the demolition and salvage of five residential structures located in the flood plain. The affected structures would be purchased at fair market value (including cost for lands and improvements) and demolished. Houses included in the demolition plan were selected on the basis of their first or main floor elevation and their relative positioning along the stream. Lands acquired during project implementation would be landscaped and turned over to the local project sponsor for purposes compatible with the flood hazard. Estimated first costs associated with the implementation of this alternative are summarized in Table 12. Costs presented in Table 12 are based on 1981 prices.

TABLE 12

SUMMARY OF FIRST COST (PLAN 1)
10-YEAR FLOOD PLAIN DEMOLITION ALTERNATIVE

Item	Cost
Building Purchase	$194,600
Land Purchase	23,500
Land Acquisition	15,270
Demolition Cost	15,000
Restoration of Evacuated Land	2,500
Subtotal	$250,870
Contingencies	11,250
Subtotal	$262,120
Engineering and Design	15,730
Supervision and Administration	10,480
Subtotal	$288,330
Salvage	(-) 19,460
Total Evacuation Cost	$268,870

In addition to the project first cost, there are additional costs associated with nonstructural measures which include the cost of relocating affected families to non-flood plain sites. These costs are considered as financial costs to be shared by non-Federal interest, but by policy are not included in the economic cost analysis. For comparative purposes a figure of $20,000 per family was used for family relocations. Therefore, additional $100,000 would be required for relocation assistance which would increase the total cost of project implementation to $368,870.

Estimates of annual costs are based on a 50-year period of analysis. Interest during construction is not included since the construction period is estimated as being less than one year. The investment costs for the proposed demolition alternative thus equal the first cost. Interest and amortization charges are based on an interest rate of 7 5/8%. Annual costs for project implementation are estimated to be $21,040 plus an additional annual cost of $7,820 for relocation expenses for a total annual charge of $28,860.

Average annual project benefits include damage reduction to existing flood plain development, residual land values, and reduced administrative costs associated with the flood insurance program. However, benefits were reduced by amounts of losses to non-insurable items, the deductible portion of each expected flood damage event, and the annual cost of the insurance premium paid by the policy holder. Table 13 summarizes average annual benefits attributable to the 10-year flood plain demolition alternative.

TABLE 13

AVERAGE ANNUAL BENEFITS (PLAN 1)
10-YEAR FLOOD PLAIN DEMOLITION ALTERNATIVE

Item		Benefit
Total Damage Reduction		$28,130
Residual Land		990
Non-Insurable Losses	(-)	980
Deductible Losses	(-)	2,190
Insurance Premium Payments	(-)	920
Insurance Operating Cost		200
Total Externalized Benefits		25,220

Average annual project benefits when compared to annual project costs yield a benefit to cost ratio of 1.20 to 1.

Impact Assessment

Implementation of the 10-year evacuation or demolition alternative on Wilson Branch would result in the displacement of five families from structures currently located within the flood plain. The relocation of families from these structures may cause serious problems to the people involved and add to the housing problems of the area. Efforts would be made to reduce the inconveniences and problems resulting from implementing this alternative. All affected persons would receive relocation benefits in accordance to policy established in Public Law 91-646, "The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970."

Implementation of this alternative would remove five structures from the housing market and place a temporary increase in the demand for housing. This would result in an increase in new housing construction in non-flood plain areas. Persons who have located in the affected structures for convenience to schools, work areas or shopping areas, or for other personal reasons may find that relocation sites are less desirable for personal needs and desires.

Structures located above the 10-year flood plain elevation would receive no benefits from the implementation of this alternative.

The estimated first cost of implementing this alternative is $268,870. This results in an annual cost of $21,040 and, when compared to benefits of $25,230, yields a benefit to cost ratio of 1.20 to 1. An additional first cost of $100,000 will also be required to relocate affected families to nonflood plain sites. As previously discussed, these costs are considered as financial costs to be shared by Federal and non-Federal interests, but not included in economic cost analyses.

Accomplishment of this alternative would result in the purchase of approximately 2.0 acres of land which would be landscaped and conveyed to the local project sponsor. Local project sponsors would be required to regulate future use of these lands in a manner compatible with the flood hazard.

Evaluation and Trade-Off Analysis

As discussed in previous sections of this report, evacuation plans were formulated to provide protection for the 2-, 4-, 8-, 10-, 25-, 50-, 100-year and the Standard Project Floods. The 10-year level of protection was

selected as the most desirable level after careful consideration of the impacts of plans providing a greater or lesser degree of protection. A lesser degree of protection was not considered desirable due to the number of families which would remain in the flood plain and be subject to flood damage. Plans providing a greater degree of protection were less favorable from an economic view point and would have greater impact on the community due to the additional number of structures required for demolition. The trade-off analysis indicated that the 10-year level of protection was the most desirable and implementable.

Mitigation Requirements

There are no mitigation measures required from the construction of this plan since implementation would not affect flood stages. The nonstructural approach considered, removes properties from the flood plain and has no adverse affects downstream.

Cost Apportionment

Apportionment of costs between Federal and non-Federal agencies for nonstructural alternatives is in general compliance with Section 78 of the Water Resources Development Act of 1974. Subject act provides that non-Federal participation in the cost of recommended nonstructural measures shall be comparable to the value of lands, easements and rights-of-way which would have been required of non-Federal interests for structural local protection measures, but in no event shall exceed 20% of the project costs. Because of the difficulty in determining the appropriate structural alternative and the fact that in some cases there may be no feasible structural alternative, it is impractical to specify on a case-by-case basis what the "comparable" cost sharing would be for nonstructural measures. Accordingly, consistent with average cost-sharing on traditional local protection projects, the non-Federal share of costs for recommended nonstructural measures has been recommended in all cases to be 20% of the first cost of such measures, thereby assuring comparability to the average value of lands, easements and rights-of-way required for Federal structural protection projects. The apportionment of project cost is tabulated in Table 14.

TABLE 14

COST APPORTIONMENT (PLAN 1)

Item	First Cost (100%)	Federal Cost (80%)	Local Cost (20%)
Project Construction Cost	$268,870	$215,100	$53,770
Associated Relocation Cost	$100,000	$ 80,000	$20,000
Total Costs	$368,870	$295,100	$73,770

FEDERAL RESPONSIBILITIES

The presently estimated Federal share of the total first cost for the 10-year flood plain demolition plan is $295,100. The Federal government is responsible for the preparation of plans and specifications and for accomplishment of the project. Acquisition of project related lands in fee title is a local responsibility. The Federal government, however, would monitor local acquisition procedures to insure fair and equitable treatment of affected individuals.

NON-FEDERAL RESPONSIBILITIES

The presently estimated non-Federal share of the total first cost for this alternative is $73,770. These costs may be either a cash or in-kind contribution. The Town of Cheraw would be responsible for property acquisition and reasonable expenses involved in the purchase of properties would serve as in kind contributions toward the local share of first costs. The local project sponsor must also adopt and enforce land use regulations to prevent the universal use of flood plain lands.

10-YEAR FLOOD PLAIN RELOCATION ALTERNATIVE (PLAN 2)

PLAN DESCRIPTION - RELOCATION

The 10-year flood plain relocation alternative for Wilson Branch calls for the physical relocation of five residential structures and their contents from the 10-year flood plain. The affected structures would be purchased at fair market value (including cost for lands and improvements) and physically

relocated to new sites free from the hazard of flooding. Houses included in the relocation plan were selected on the basis of their first or main floor elevation. Lands acquired during project implementation would be landscaped and turned over to the local project sponsor for use compatible with the flood hazard. Estimated first costs associated with the implementation of this alternative are summarized in Table 15. Costs presented in Table 15 are based on 1981 prices.

TABLE 15

SUMMARY OF FIRST COST (PLAN 2)
10-YEAR FLOOD PLAIN RELOCATION ALTERNATIVE

ITEM	COST
Building Purchase	$194,600
Land Purchase	23,500
Acquisition Cost	15,270
Restoration of Evacuated Land	2,500
Subtotal	$235,870
Contingencies	8,250
Subtotal	$244,120
Engineering and Design	14,650
Supervision and Administration	9,760
Subtotal	$268,530
Relocation and Land Purchase	29,550
Acquisition Cost Relocation sites	2,070
Development Cost Relocation Sites	12,500
Property Resale Cost	15,690
Building Moving Cost	127,620
Subtotal	$455,960
Contingencies - Relocation	37,490
Subtotal	$493,450
Engineering and Design - Relocation	13,500
Supervision and Administration - Relocation	9,000
Total Relocation Cost	$515,950

In addition to the project first cost, there are additional costs associated with this plan which include the cost of relocating affected families to non-flood plain sites. These costs are considered a financial cost to be shared by non-Federal interest, but by policy are not included in the economic cost analysis. For comparative purposes a figure of $20,000 per family was used for family relocations. Therefore an additional $100,000 would be required for relocation assistance which would increase the total cost of project implementation to $615,950.

Estimates of annual costs are based on a 50-year period of analysis. Interest during construction is not included since the construction period is estimated as being less than one year. The investment cost for the proposed relocation alternative thus is equal to the first cost. Interest

and amortization charges are based on an interest rate of 7 5/8%. Annual costs for project implementation are estimated to be $40,360 plus an additional annual cost of $7,820 for relocation expenses for a total annual charge of $48,180.

Average annual project benefits include damage reduction to existing flood plain development, residual land values, the value of relocated buildings and building sites, and reduced administrative costs associated with the flood insurance program. Benefits were reduced by amounts of losses to non-insurable items, the deductible portion of each expected flood damage event, and the annual cost of the flood insurance premiums paid by the policy holder. Table 16 summarizes average annual benefits attributable to the 10-year flood plain relocation plan.

TABLE 16

AVERAGE ANNUAL BENEFITS (PLAN 2)
10-YEAR FLOOD PLAIN RELOCATION ALTERNATIVE

Item	Benefit
Total Damage Reduction	$28,140
Residual Land Value	990
Non-Insurable Losses	(-) 980
Deductible Losses	(-) 2,190
Insurance Premium Payments	(-) 920
Insurance Operating Cost	200
Value of Relocated Buildings and Sites	19,740
Total Externalized Benefits	$44,970

Average annual project benefits when compared to annual project costs yields a benefit to cost ratio of 1.11 to 1.

Impact Assessment

Implementation of the 10-year relocation alternative on Wilson Branch would result in the displacement of five families from structures currently located within the flood plain. The relocation of families may cause serious problems to the people involved and add to the housing problems of the area. All efforts, however, would be made to reduce the inconveniences and problems resulting from implementing this alternative. All affected persons would receive relocation benefits in accordance to policy established in Public Law 91-646, "The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970."

Implementation of this alternative would remove five structures from the flood plain and relocate these structures on highland lots. This would result in the disruption of approximately 2.0 acres of undeveloped land which would be required for relocation sites. Persons who have located in affected structures at the existing sites for convenience to schools, work areas or shopping areas, or for other personal reasons may find the relocation sites less desirable for personal needs and desires.

Structures located above the 10-year flood plain elevation would receive no benefits from the implementation of this alternative.

The estimated first cost of implementing this alternative is $515,950. This results in an annual cost of $40,360 and when compared to annual benefits of $44,970 yields a benefit to cost ratio of 1.11 to 1. An additional first cost of $100,000 will also be required to relocate affected families to nonflood plain sites. As previously discussed, these costs are considered as financial costs to be shared by Federal and non-Federal interests, but not to be included in economic cost analyses.

Construction of this alternative would require the purchase of approximately 2.0 acres of land at the current location of flood plain structures and an additional 2.0 acres of land for relocation sites. Acquired flood plain lands would be landscaped and title conveyed to the local project sponsor. Local project sponsors would be required to regulate future development of these lands in a manner compatible with the flood hazard.

Evaluation and Trade Off-Analysis

As discussed in previous sections of this report, relocation plans were formulated to provide protection for the 2-, 4-, 8-, 10-, 25-, 50-, 100-year and the Standard Project Floods. The 10-year level of protection was selected as the most desirable level after careful consideration of the impacts of plans providing a greater or lesser degree of protection. A lesser degree of protection was not considered desirable due to the number of families which would remain in the flood plain and be subject to flood damage. Plans providing a greater degree of protection were less favorable from an economic viewpoint and would have greater impact on the community due to the additional number of structures relocated. It is concluded that the 10-year level of protection was the most desirable and implementable.

Mitigation Requirements

There are no mitigation measures required from the implementation of this plan since implementation would not affect flood stages. The non-structural concept removes properties from the flood plain and has no adverse affects downstream.

Cost Apportionment

Apportionment of costs between Federal and non-Federal agencies for nonstructural alternatives is in general compliance with Section 78 of the Water Resources Development Act of 1974. Subject act provides that non-Federal participation in the cost of recommended nonstructural measures shall be comparable to the value of lands, easements, and rights-of-way which would have been required of non-Federal interests for structural local protection measures, but in no event shall exceed 20% of the project costs. Because of the difficulty in determining the appropriate structural alternative and the fact that in some cases there may be no feasible structural alternative, it is impractical to specify on a case-by-case basis what the "Comparable" cost sharing would be for nonstructural measures. Accordingly, consistent with average cost sharing on traditional local protection projects, the non-Federal share of costs for recommended nonstructural measures has been recommended in all cases to be 20% of the first cost of such measures, thereby assuring comparability to the average value of lands, easements and rights-of-way required for Corps structural protection projects. The apportionment of project costs is tabulated on Table 17.

TABLE 17

COST APPORTIONMENT (PLAN 2)

Item	First Cost (100%)	Federal Cost (80%)	Local Cost (20%)
Project Construction Cost	$515,950	$412,760	$103,190
Associated Relocation Cost	100,000	80,000	20,000
Total Costs	615,950	492,760	123,190

Federal Responsibilities

The presently estimated Federal share of the total first cost for the 10-year flood plain evacuation plan is $492,760. The Federal government is responsible for the preparation of plans and specifications and for construction of the project. Acquisition of project related lands in fee title is a local responsibility. The Federal government, however, would monitor local acquisition procedures to insure fair and equitable treatment of affected individuals.

Non-Federal Responsibilities

The presently estimated non-Federal share of the first cost for construction of this alternative is $123,190. Non-Federal share of project cost may be either a cash or in-kind contribution. The Town of Cheraw would be responsible for property acquisition and reasonable expenses involved in the purchase of properties would serve as an in-kind contribution toward the local share of project first cost. The local project sponsor must also adopt and enforce land use regulations to prevent the unwise use of flood plain lands.

DO-NOTHING ALTERNATIVE (PLAN 3)

Plan Description

The no action alternative for Wilson Branch would recommend no modification to the existing stream or to flood plain structures. Existing structures would remain subject to periodic inundation, however, even with the do-nothing alternative, recommendation would be made to update and enforce flood plain regulatory measures to prevent future development which would be subject to flood damage. There would be essentially no first cost involved in the implementation of this alternative and no tangible benefits.

Impact Assessment

The impact of the no action alternative would essentially be the same as for existing conditions with the exception of more stringent controls on future development. Flood damages would be expected to continue at a rate of $33,710 annually. Periodic disruption in the flow of traffic would also be expected during flood periods and local residents would remain subject to the inconveniences and monetary losses resulting from flood conditions. The health and safety of flood plain occupants would also be endangered by the adoption of the no action alternative.

Environmental impacts would be minimal with the exception of environmental losses which would occur during flood periods. These adverse impacts include stream bank erosion and the unsightly and detrimental deposition of sediment and debris in the stream channels and overbank areas.

Evaluation and Trade-Off Analyses

Adoption of a no action alternative would trade-off potential flood damage reduction benefits to preserve the existing environment of the area. Residents and local government would have to be willing to accept periodic flooding to avoid the investment and other impacts of impending corrective work. Local residents, however, have strongly supported proposals to implement some form of flood damage reduction measure.

Mitigation Requirements

There are no mitigation measures required since the no action plan would not have any effect on existing streams or flood plain structures.

Cost Apportionment

There is no first cost associated with the adoption of the no action alternative.

Federal Responsibilities

Federal responsibilities associated with the adoption of this plan consist of providing adequate flood plain information to the local government for their use in enforcing regulatory measures.

Non-Federal Responsibilities

Non-Federal responsibilities would consist of the update and enforcement of flood plain regulations to prevent unwise development of flood plain lands. The local government would also be responsible for providing emergency services during flood periods.

VIEWS OF NONFEDERAL AGENCIES

Formulated plans for flood control on Wilson Branch have been coordinated with various non-Federal agencies through various formal and informal means. Coordination with the South Carolina Department of Archives and History indicated that the probability of affecting archaeological sites by plan implementation was too minimal to warrant a survey.

The Town of Cheraw has indicated strong support of the plan for removal of flood plain structures. By letter dated 21 May 1982 the town stated their intent to sponsor flood control improvements, provided that the property owners directly involved in the project reimburse the Town with 50% of the local share of project cost. Local property owners have consented to the town's proposal. (See pertinent correspondence in Appendix 3). The town is fully aware of the requirements of PL 91-646 (Real Property Acquisition Policies Act of 1970) and has indicated their intention to comply with the requirements of this law. An unsigned draft copy of the required local cooperation documents is included in Appendix 4 to this report.

VIEWS OF FEDERAL AGENCIES

The formulated plans presented in previous sections of this report have been coordinated with representatives of pertinent Federal and non-Federal agencies through formal and informal means. Pertinent correspondence received to date from these agencies is included in Appendix 3 of this report. The U.S. Fish and Wildlife report, which is required by law, is also included in Appendix 3. Future pertinent comments received by various agencies upon review of this final report will be included as revisions to Appendix 3 upon receipt of the comments.

COMPARISON OF DETAILED PLANS

The purpose of this section of the feasibility report is to identify and compare significant impacts of each plan carried into Stage 3 of the plan formulation process and to evaluate each plan's contribution to the NED, EQ, RED and OSE accounts of the Principles and Standards. During this process, all beneficial and adverse impacts are identified, quantitatively or qualitatively, including who gains or loses, locational incidence, and time of occurrence. Specified criteria are also applied to the various plans to test their responsiveness. These criteria are: acceptability, completeness, effectiveness, and efficiency, as explicitly stated in the Principles and Standards; and certainty, geographic scopes, NED benefit-cost ratio, reversibility and stability.

Table, 12, the System of Accounts (reference display requirements - 18 CFR-711-71), provides a means for comparision of alternative candidate plans. The table displays each plan carried through the final iteration and the beneficial and adverse contributions to the planning objectives made by each alternative. Contributions are indicated in essentially physical terms with considerable flexibility to allow the interdisciplinary planning team to choose appropriate descriptive units. Table 12 is used to display the breath and detail of the assessment and evaluations of alternative plans and their effects in the NED, EQ, RED, and OSE accounts.

RATIONALE FOR DESIGNATION OF NED PLAN

The Principles and Standards require the designation of a National Economic Development (NED) Plan. This plan is described as the plan which best addresses the planning objectives in a way which maximizes net economic benefits. The NED plan must have net economic benefits. Alternative measures considered in the formulation of a NED plan are evaluated according to economic criteria. However, the design of physical structures is done according to engineering criteria. As is true for all alternatives, sound design based upon the interdisciplinary inputs of the planning team is required for a NED plan. Because a NED plan includes all measures to address planning objectives whose incremental dollar benefits exceed dollar costs; mitigation, preservation, or enhancement measures may be included when they are economically justified. Based upon the above criteria, Plan 1, the 10-Year Flood Plain Demolition alternative has been designated as the NED plan. This plan provides the greatest amount of net economic benefits for the least first cost expenditure. Plan 1 also has the highest benefit to cost ratio of 1.20 to 1.

TABLE 1B
SYSTEM OF ACCOUNTS
WILSON BRANCH - CHERAW

ACCOUNTS AND EFFECTS	PLAN 1 Nonstructural Demolition EQ Plan WED Plan	TIMING	UNCERTAINTY	EXCLUSIVITY	ACTUALITY	PLAN 2 Nonstructural - Relocation	TIMING	UNCERTAINTY	EXCLUSIVITY	ACTUALITY	PLAN 3 Do Nothing	TIMING	UNCERTAINTY	EXCLUSIVITY	ACTUALITY
PLAN DESCRIPTION	DEMOLISH 5 HOUSES					RELOCATE 5 HOUSES					Do Nothing				
I. NATIONAL ECONOMIC DEVELOPMENT															
A. Beneficial Impacts (Annual)															
1. Flood Damage Reduction Benefits With Allowance	$ 28,140	3	5	7	9	$ 28,140	3	5	7	9	0				
2. Other Tangible Benefits	- 2,910	1	5	7	9	16,530	1	5	7	9	0				
3. Total Annual Net Benefits	25,230	3	5	7	9	44,970	3	5	7	9	0				
B. Adverse Impacts															
1. Project First Cost	$ 268,870	1	5	7	9	515,950	1	5	7	9					
2. Related Moving (nonprofit)	100,000	3	5	7	9	100,000	3	5	7	9	0				
3. Annual Project Cost	21,040	3	5	7	9	40,360	3	5	7	9	0				
4. Annual Related Cost	7,820					7,820					0				
C. Net NED Benefits (annual)	$ 4,190	3	5	7	9	4,610	3	5	7	9					
D. Benefit to Cost Ratio	1.20 to 1					1.11 to 1					0				
II ENVIRONMENTAL QUALITY															
A. Enhanced															
1. Esthetics*	Vacated lots available for recreational purposes.	2	5	8	9	Same as plan 1	2	5	8	9	No significant impact				
2. Man-Made Resources*	Reduced Adverse Effects of Flooding.	3	5	8	9	Same as plan 1	3	5	8	9	Flooding would continue	3	6		
3. Natural Resources*	Improved vegetation growth.	3	5	8	9	Same as plan 1	3	5	8	9	Flooding would continue	3	6		
4. Air Quality*	No Significant Enhancement.					No Significant Enhancement.					No Impact				
5. Noise*	No Significant Enhancement.					No Significant Enhancement.					No Impact				
6. Water Quality*	No Significant Enhancement.					No Significant Enhancement					No Impact				
B. Degraded															
1. Esthetics*	No Significant Impact					Non flood plain land disrupted to relocate houses.	1	5	8	9	Frequent Flooding.	3	6		
2. Man-made Resources*	5 Houses Demolished.	3	5	8	9	Same as plan 1.	3	5	8	9	Flooding would continue.	3	6		
3. Natural Resources*	Improved vegetation growth.	3	5	8	9	Same as plan 1.	3	5	8	9	Flooding would continue.	3	6		
4. Air Quality*	No Significant Enhancement.					No Significant Enhancement.					No Impact.				
5. Noise*	No Significant Enhancement.					No Significant Enhancement.					No Impact.				
6. Water Quality*	No Significant Enhancement.					No Significant Enhancement					No Impact				
B. Degraded															
1. Esthetics*	No Significant Impact.					Non flood plain land disrupted to relocate houses.	1	5	8	9	Frequent Flooding.	3	6		
2. Man-made Resources*	5 Houses Demolished.	1	6	8	9	5 Houses Relocated.	1	6	8	9	Continued Flooding.	3	6		
3. Natural Resources*	No Significant Impact.					No Significant Impact.					Frequent Flooding.	3	6		
4. Water Quality*	No Impact.					No Impact					No Impact				
5. Air Quality*	No Adverse Impact					No Adverse Impact					No Impact.				
6. Noise*	Temporary increase during construction.	1	5	8	9	Temporary increase during construction.	1	5	8	9	No Impact				
III SOCIAL WELL BEING															
A. Beneficial Impacts															
1. Community Cohesion*	Strong Local Support	1	6	8	9	Strong Local Support	1	6	8	9	Frequent Flooding Disrupts Community	3	6	8	9
2. Community Growth	Encourages Non Floodplain Growth	3	6	8	9	Encourages Non Floodplain Growth	3	6	8	9	Controls Floodplain Development				

TABLE 18 (Continued)
SYSTEM OF ACCOUNTS
WILSON BRANCH

ACCOUNTS AND EFFECTS	PLAN 1 Nonstructural Demolition SQ Plan HED Plan	TIMING	UNCERTAINTY	EXCLUSIVITY	ACTUALITY	PLAN 2 Nonstructural Relocation	TIMING	UNCERTAINTY	EXCLUSIVITY	ACTUALITY	PLAN 3 Do Nothing	TIMING	UNCERTAINTY	EXCLUSIVITY	ACTUALITY	
3. Recreational Opportunities	Reclaimed land suitable for recreation use.	2	4	B	9	Reclaimed land suitable for recreation use.	2	4	B	9	Negligible Adverse Impacts.					
B. Adverse Impacts																
1. Community Cohesion*	Demolition activities disrupt community.	2	6	B	9	Relocation activities disrupt community.	2	6	B	9	Continued economic and property damage flooding.	3	6	B	9	
2. Community Growth*	Negligible adverse impacts.					Negligible adverse impacts.					Negligible adverse impacts.					
3. Recreational Opportunities*	Negligible adverse impacts.					Negligible adverse impacts.					Negligible adverse impacts.					
6. Displacement of People*	Five families displaced.	1	6	B	9	5 families displaced	1	6	B	9	No persons displaced.	3	6	B	9	
IV OTHER ECONOMIC EFFECTS																
A. Beneficial Impacts																
1. Tax Revenues	No beneficial impact.					No beneficial impact					No impact.					
2. Property Values	Negligible impact.					Negligible impact					No impact.					
3. Public Service	Negligible impact.					Negligible impact.					No impact.					
4. Regional Growth	Encourages non floodplain growth.	3	6	B	9	Encourages non floodplain growth.	3	6	B	9	Encourages non floodplain growth	3	6	B	9	
5. Employment	Increased employment during construction.	1	6	B	9	Increased employment during construction.	1	6	B	9	No impact.					
6. Business and Industry	Increased demand for new facilities.	2	6	B	9	Negligible impact.					No impact.					
B. Adverse Effects																
1. Tax Revenues*	Loss of 5 taxable structures.	3	6	B	9	Loss of 5 taxable structures.	3	6	B	9	No impact.					
2. Property Values	Decreased values due to floodplain location.	3	6	B	9	Decreased values due to floodplain location.	3	6	B	9	Continued decrease due to frequent flooding.	3	6	B	9	
3. Public Service*	Negligible impact.					Negligible impact.					Negligible impact.					
4. Regional Growth	Negligible impact.					Negligible impact					No impact.					
5 Employment	Negligible impact.					Negligible impact.					No impact.					
6. Business and Industry	Negligible impact.					Negligible impact.					Negligible impact.					
7 Displacement of Farms	No impact.					No impact.					No impact.					

TIMING

1 Impact is expected to occur prior to or during implementation of the plan

2 Impact is expected within 5 years following plan implementation

3 Impact is expected within a longer time frame (5+ or more years following implementation)

UNCERTAINTY

4 The uncertainty associated with the impact is all or some

6 The uncertainty is between B and 4

8 The uncertainty is less than 6

EXCLUSIVITY

B Overlapping costs will be considered in NED account

9 Overlapping costs will not be considered in NED account

ACTUALITY

4 Impact will occur with implementation

5 Impact will occur only when specific additional action is carried out during implementation*

9 Impact will not occur because necessary additional actions are taken

ASTERISK denotes items specifically mentioned in Section 122 of Public Law 91-611 for evaluation.

RATIONALE FOR DESIGNATION OF EQ PLAN

Recognizing that the environmental quality has both natural and human manifestations, an EQ or least environmentally damaging plan, addresses the planning objectives in a way which emphasizes aesthetic, ecological, and cultural contributions. Beneficial EQ contributions are made by preserving, maintaining, restoring or enhancing the significant cultural and natural attributes of the study area. Determination of EQ benefits involves subjective analysis, underscoring the need for interdisciplinary planning with extensive public input, to place values on the environmental contributions of plans. Designation of EQ plans involves measuring the environmental changes related to different plans and selecting those which, based on public input, contribute to or are most harmonious with environmental objectives. This means that EQ plans are those which make the "best" contribution to one or more components of the EQ account. Two formulated plans were considered for designation as the EQ or least environmentally damaging plan. These plans were the 10-year demolition alternative, Plan 1, and the 10-year relocation alternative, Plan 2, The demolition alternative, however, was considered to be the least environmentally damaging plan of all plans considered. This alternative would remove all development from the 10-year flood plain limits and would restore these lands to a natural setting or provide the opportunity for recreational development. Undeveloped highland areas, however, may be disturbed with the implementation of this plan in order to construct replacement houses for those which would be destroyed. Plan 1 was considered to have a net positive contribution to the environment and was thus designated as the EQ plan.

RATIONALE FOR SELECTED PLAN

The process of selecting a plan for authorization consisted of careful evaluation of the contributions of each plan to the four accounts of Principles and Standards and evaluating the acceptability of the plan by the general public and the local sponsoring agency. The selection process was performed using input from all levels of government, including input from various agencies of the county, state and Federal governments and public input obtained from the Workshop sessions held on 29 April 1982 and 20 May 1982.

All evaluated plans with the exception of the do-nothing alternative adequately addressed the stated planning objective of flood damage reduction and each plan would be fully implementable from a engineering viewpoint. Social evaluations, however, indicated a strong preference by the general public for the adoption of a nonstructural alternatives. Since Plan 1 best addressed the planning objectives and was also designated as the EQ and NED Plan, Plan 1 was selected as the recommended plan.

CONCLUSIONS

During the course of investigations performed to evaluate and the feasibility of implementing flood damage reduction measures on Wilson Branch, numerous potential alternatives were evaluated before a plan was selected for recommendation. These alternatives included an array of potential structural and nonstructural measures which provided varying degrees of protection. Careful evaluation of structural measures indicated that these approaches were unimplementable. Since no measures involving discharge of dredge or fill materials into the navigable waters of the United States or adjacent wetlands were considered as viable alternatives, the evaluations required under Section 404(b)(1) of the Clean Water Act were not necessary.

Therefore, based on the results of detailed technical, environmental and social evaluations, it is concluded that implementation of flood plain demolition Plan 1, as described in previous sections of this report, is the most feasible plan to reduce flood damages on Wilson Branch. The plan consist of demolishing for salvage five houses below the 10-year flood plain. Reclaimed lands will be turned over to the local sponsor. Implementation of this plan will reduce projected annual flood damages to existing development by approximately 83%.

Impacts of formulated alternatives were fully evaluated and compared in the process of selecting a recommended plan for flood damage reduction. Impacts of the selected plan are further discussed in the Findings of No Significant Environmental Impact sections contained in subsequent portions of this report.

RECOMMENDED PLAN

The recommended plan of improvement for Wilson Branch consists of demolishing five houses which lie below the 10-year flood plain on Wilson Branch. The five adjacent houses lie in a reach from 500 to 1500 feet from the mouth of Wilson Branch.

All disturbed areas would be planted with grass, shrubs and trees to prevent erosion and to restore a natural appearance. Project lands would be obtained and controlled by the local project sponsor for maintenance purposes. Local project sponsors must also enforce flood plain ordinances to assure that any future development of the residual flood plain would be compatible with the flood hazard.

Estimated first cost for implementation of the recommended plan is $268,870 plus an additional $100,000 in related cost for the relocation of current occupants of affected flood plain structures. Project cost allocations would consist of a Federal expenditure of $295,100 and a non-Federal expenditure of $73,770. A breakdown of these costs is contained in Table 12. Average annual project costs are estimated to be $20,040. Annual project costs are based on a projected 50-year project life, an interest rate of 7 5/8% and 1981 prices.

Average annual project benefits resulting from the implementation of the recommended plan of improvement are estimated to be $25,230 in flood damage reduction benefits to existing development. Only benefits to existing development were used for project formulation purposes and for comparison with other flood damage reduction alternatives. The benefit to cost ratio, assuming benefits to existing development only, is 1.20 to 1. If future damage reduction benefits were included in the economic analysis, the resultant benefit to cost ratio would increase. Detailed information pertaining to the economic analysis of the recommended plan is contained in Appendix 4 to this report. The recommended plan is also in compliance with the intent of Executive Order 11988.

In selling the houses for salvage, it is only assumed they would be demolished. The possibility exists that it would be more benefical for the salvage concern to relocate the houses to land outside the flood plain. This decision would be left to the contractor.

Table 19 displays the effects of the selected plan on particular types of resources recognized by Federal policies. This is followed by Table 20 showing the compliance with appropriate WRC designated environmental statutes, referred to in the Office of Management and Budget Circular No. A-11.

TABLE 19

EFFECTS OF THE RECOMMENDED PLAN ON RESOURCES
OF PRINCIPAL NATIONAL RECOGNITION

Types of Resources	Principal Sources of National Recognition	Measurement of Effects
Air Quality	Clean Air Act, As amended (42 U.S.C. 185h-7 et.seq)	No Effect
Areas of particular concern within the coastal zone	Coastal Zone Management Act of 1972, as amended (I8 USC 1451 et. seq.)	No Effect
Endangered and threatened species	Endangered Species Act of 1973, as amended (16 USC 1531 et.seq.)	No Effect
Fish and Wildlife Habitat	Fish and Wildlife Coordination Act (16 USC Sec. 661 et. seq.)	No Effect - Reference Fish and Wildlife Coordination Report (App. 3)
Flood plains	Executive Order 11988, Flood Plain Management	2.0 acres of flood plain restored to natural condition
Historic and Cultural Properties	National Historic Preservation Act of 1966, as amended (16 U.S.C. Sec. 470 et. Seq)	None identified
Prime and Unique Farmland	CEQ Memorandum of August 1, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act.	No Effect
Water Quality	Clean Water Act of 1977 (33 U.S.C. 1251 et. Seq.)	Point sources of pollution removed from 1400 foot of steam. No change expected in water quality classifications
Wetlands	Executive Order 1190, Protection of Wetlands, Clean Water Act of 1977 (42 U.S.C. 1857h-7, et. Seq.)	No Effect
Wild and Scenic Rivers	Wild and Scenic Rivers Act, as amended (16 U.S.C. 1271, et. Seq.)	Not present in planning area

TABLE 20

COMPLIANCE OF THE RECOMMENDED PLAN WITH WRC DESIGNATED ENVIRONMENTAL STATUTES

Federal Policies	Compliance
Archeological and Historical Preservation Act, 16 U.S.C. 469 et.Seq.	Full Compliance
Clean Air Act, as amended, 42 U.S.C. 1857-7, et. Seq.	Full Compliance
Clean Water Act (Federal Water Pollution Control Act), 33 U.S.C. 1251 et. Seq.)	Full Compliance
Coastal Zone Management Act, 16 U.S.C. 1451 et. Seq.	Not Applicable
Endangered Species Act, 16 U.S.C. 1531 et. Seq.	Full Compliance
Estuary Protection Act, 16 U.S.C. 1221 et. Seq.	Not Applicable
Federal Water Project Recreation Act, 16 U.S.C. 460-1 (12) et. Seq.	Not Applicable
Fish and Wildlife Coordination Act, 16 U.S.C. 661 et. Seq.	Full Compliance
Land and Water Conservation Fund Act, 16 U.S.C.460/-460/-11 et. Seq.	Full Compliance
Marine Protection, Research and Santuary Act, 33 U.S.C. 1401 et. Seq.	Full Compliance
National Environmental Policy Act, 41 U.S.C. 4321, et. Seq.	Full Compliance
National Historic Preservation Act, 16 U.S.C. 470a, et. Seq.	Full Compliance
Rivers and Harbors Act, 33 U.S.C. 403 et. Seq.	Not Applicable
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et. Seq.	Not Applicable
Wild and Scenic Rivers Act, 16 U.S.C. 1271 et. Seq.	Not Applicable

ENVIRONMENTAL ASSESSMENT
WILSON BRANCH FLOOD CONTROL PROJECT

This environmental assessment is based on evaluation factors affecting public interest which include, but are not limited to flood control, fish and wildlife, water quality, economics, conservation, aesthetics, recreation, and in general, the needs and welfare of the people.

The Environmental Assessment of The Proposed Action

This assessment was prepared by review of aerial photographs as well as on-site inspection, public hearings and coordination with various Federal, State and local agencies, conservation groups and interested individuals. Comments were requested from:

Environmental Protection Agency
The U.S. Department of The Interior Fish and Wildlife Service
South Carolina Department of Archives and History
Soil Conservation Service

Need For The Project

At certain times of the year when the Pee Dee River rises and/or when excessive rain water flows into Wilson Branch, the residential area along the lower reach of Wilson Branch floods. In response to a request by the Town of Cheraw, a reconnaissance study was conducted resulting in a finding that the flood problem was severe enough to justify detailed studies of measures to reduce the flood damage.

Project Description

Flood control measures would consist of purchasing, by the Government, five houses located below the 10-year flood plain. The houses would be removed from the flood plain, either salvaged or sold as a unit. The foundations and driveways would be removed and the lot would be seeded. The area to be seeded is approximately 2,000 square feet per lot (10,000 square feet total). A private bridge and a walkway which crosses the stream would also be removed.

General Description of The Area

The Town of Cheraw is located in Chesterfield County in northeastern South Carolina adjacent to the Pee Dee River. Cheraw is located 61 miles southeast of Charlotte, North Carolina and 75 miles northeast of Columbia, South Carolina. The town is basically residential except for a downtown area consisting of small businesses and some small industrial plants. Wilson Branch lies almost wholly within the corporate limits of Cheraw. Wilson Branch flows in a generally northeast direction to its confluence with Huckleberry Branch, the northern city limit, then to the Pee Dee River Approximately 1 3/4 miles away.

Topography and Soils

The area surrounding Cheraw is hilly with an average elevation of 150 feet National Geodetic Vertical Datum (NGVD). It is dissected by small drainage basins such as Wilson Branch and Huckleberry Branch. Soils in Cheraw are of the Norfolk-Gilead-Rutledge association. The well-drained Norfolk soils represent 40 percent of the association and are on the highest ridges. Surface layers are gray loamy sand, 18 to 30 inches thick. Subsoils are friable, yellowish, brown sandy clay loam. Gilead soils, comprising about 25 percent, are on the lower ridges and the gentler side slopes. They have light gray to gray loamy sand surface layers. Subsoils are brownish-yellow, compact sandy clay loam or sandy clay. The wet Rutledge soils, comprising about 20 percent, are in the oval-shaped upland depressions and along the poorly drained stream channels. Surface layers are black loamy sands, high in organic matter, and subsoils are gray loamy sands usually saturated with water.

Climate

Cheraw has mild winters and hot summers. Temperatures drop below freezing on about 70 days during the year but rarely reach 0^{o}F. Temperatures reach 90^{o} on about 90 days during the year. The area receives about 47 inches of precipitation per year.

Wildlife

All wildlife species which occur in a typical residential, upper coastal plain stream bottom and habitat can be expected to occur in the Wilson Branch study area. No unusual or critical terrestrial habitat appears in the study area.

Fish

Wilson Branch is a shallow, narrow stream and does not support a significant fishery. The stream bottom consists of a silty-gravel base.

Threatened and Endangered Species

There is no critical habitat for any endangered or threatened species. Furthermore, there does not appear to be any potential for adversely affecting any endangered or threatened species.

Flora

Vegetation occuring in the study area is typical of southern coastal plain flora. The major tree species found in the immediate area include Sweetgum, Blackgum, Yellow Poplar, Sugarberry, Loblolly Pine, Longleaf Pine, Water Oak, and Willow Oak. The predominate understory and ground cover species include Dogwood, Privet, Honeysuckle, Poison Ivy, Virginia Creeper, Rushes, plantains and potentillas.

Water Quality

Wilson Branch lies within the Yadkin-Pee Dee River Basin. It is a relatively short stream approximately two miles in length, with headwaters originating on the west side of the Town of Cheraw, originating as an intermittent stream at the headwater. It develops into a perennial stream

prior to its confluence with Huckleberry Branch. Normally the stream is narrow and shallow. Water quality has decreased in recent years partly as a result of rapid residential growth along the stream. The State of South Carolina has classified Wilson Branch as Class B waters suitable for domestic supply after complete treatment in accordance with requirements of the South Carolina State Board of Health. Class B waters are also suitable for propagation of fish, industrial and agricultural uses and other uses requiring water of less quality.

Water Supply

The Town of Cheraw draws its water directly from the Pee Dee River. Although water treatment is required, the source is more than ample for the future.

Cultural Resources

The National Register of Historic sites list two sites which occur within Cheraw. The sites include (1) Cheraw Historic District and (2) St. Davids Episcopal Church and Cemetery. The lower reaches of Wilson Branch involved in the study area are outside of the historic sites. Additionally, coordination with the State Historic Preservation Officer (SHPO) has been maintained during project planning.

PROBABLE IMPACT OF PROPOSED ACTION

The proposed action would provide approximately 1500 feet of nonstructural flood protection. This protection would reduce projected annual flood damage to the existing development on Wilson Branch.

Land Disruption

It is not envisioned that this project would induce changes in patterns of land use.

Noise

During the demolition or salvage phase there would be an increase in the ambient noise level, but it is anticipated that this increase will not be significant.

Water Quality

It is not expected that any significant impact on water quality would be realized as a result of this proposal. It is possible that some slight enhancement may be realized as five houses would be removed from the Wilson Branch drainage area.

Since the recommended plan does not involve the discharge of dredged or fill materials into the navigable waters of the United States or adjacent wetlands, the evaluations required under Section 404(b)(1) of the Clean Water Act were not necessary.

Air Quality

Any increase in air pollution would occur during the demolition or salvage of the houses as a result of exhaust fumes from equipment. The increase would be minor and temporary.

Historical and Archaeological Resources

There are no historical or archaeological resources in the immediate area of the proposed project. The project will not have any impacts on any property in or listed as eligible in the National Register of Historical Places.

Fisheries

No impact.

Wildlife

There would be no significant impact on area wildlife.

Socio-Economic

The major center of population, which affects the future growth of Wilson Branch Basin is the Town of Cheraw in Chesterfield County. A large portion of the town lies within the basin limits.

Data for Chesterfield County is considered to be indicative of the basin area. The population of Chesterfield County has increased from 33,667 in 1970 to 38,161 in 1980.

Data on employed civilian workers by occupational group are available from the 1970 Census of Population. The largest group of workers in Chesterfield County was in nonagricultural employment. Of this group 51.4 percent were in manufacturing related employment. Wholesale and retail trade make up 12.5 percent of the group.

Endangered Species

This nonstructural flood control project would not jeopardize the continuing existence of any threatened or endangered species. There is no critical habitat within the area of project influence.

UNAVOIDABLE ADVERSE IMPACTS

Adverse environmental effects associated with this project would be a temporary increase in noise and air pollution during the demolition or salvage phase of this project.

ALTERNATIVES TO PROPOSED ACTIONS

During the course of investigations conducted on Wilson Branch several flood damage reduction alternatives were evaluated in varying degrees of detail as discussed in the main report. These alternatives include an array of structural and nonstructural solutions which was gradually reduced in number as further data became available.

NONSTRUCTURAL MEASURES

Nonstructural measures do not attempt to reduce or eliminate flooding, but are directed at regulating the use of and development within a flood plain, thus lessening damaging effects. Nonstructural measures consist of subdivision regulations, zoning, building codes, flood proofing, evacuation, relocation, open space development, restriction of building financing, flood insurance, urban development, and reconstruction or removal of bridges which restrict flow.

STRUCTURAL MEASURES

a. Leveed floodways provide an alternative structural solution by restricting floods from portions of the flood plain highly susceptible to flood damage. This solution was judged infeasible since the affected houses are so close to Wilson Branch that such a plan was not found to be cost effective.

b. Reservoirs provide a structural alternative to control flooding by storing runoff and thus reducing the peak flows downstream. The construction of a reservoir in a highly urbanized area would be impractical and would not solve flooding problems caused by backwater from the Pee Dee River.

c. Channel conveyance improvements would consist of various modifications to the existing channel which result in an increased flow capacity. These improvements include cleaning, deepening, widening and/or channel realignment. Channel conveyance improvement by deepening and widening is not a potentially feasible alternative, since it would not solve flooding problems caused by backwater from the Pee Dee River.

All alternatives to the proposed action are discussed in detail in the main report and were evaluated in sufficient detail to permit the selection of a recommended plan of action.

CONCLUSIONS

The proposed action does not constitute a major Federal action significantly affecting the quality of the human environment, therefore, the preparation of an Environment Impact Statement (EIS) provided for under Section 102(c) of the National Environmental Policy Act of 1969 is not required.

FINDINGS OF NO SIGNIFICANT IMPACT

The U.S. Army, Corps of Engineers proposes to demolish five houses within the 10-year flood plain on Wilson Branch. The five houses lie in a reach from 500 to 2000 feet from the mouth of Wilson Branch. The foundations and driveways would be removed and the lots seeded. The area to be seeded is approximately 2,000 square feet per lot or 10,000 square feet total. A private bridge and a walkway which crosses the stream would also be removed.

Field surveys of the study area were conducted to determine the impacts of the proposed plan on the natural environment. During these surveys it was determined that there would be no significant impacts to the area wildlife and fish. It was also concluded from field surveys that no Federally listed endangered or threatened species or critical habitat for any species would be impacted by the proposed non-structural flood control plan.

Coordination with the S.C. State Historic Preservation Officer (SHPO) indicates that there are no sites in the immediate study area currently listed or eligible for listing on the National Register. The buildings to be demolished do not meet the criteria for inclusion on the Register. It is also the opinion of the SHPO that the probability of affecting archeological sites of significants is too minimal to warrant further concern.

Public participation has been an integral part of the planning process for this project. Coordination has been maintained with the appropriate agencies and individuals.

Because the environmental assessment does not indicate that the proposed project is a major Federal action significantly affecting the human environment, I have determined that an Environmental Impact Statement is not required.

BERNARD E. STALMANN
LTC, Corps of Engineers
District Engineer

RECOMMENDATIONS

I recommend that the 10-year flood plain evacuation plan, consisting of the removal of five (5) flood prone residential structures, be authorized for implementation with such modifications as in the discretion of the Chief of Engineers may be advisable, for flood damage reduction on Wilson Branch, Cheraw, South Carolina. The estimated first cost to the United States is presently estimated at $295,100 and the estimated first cost to the local project sponsor is $73,770.

Consistent with the requirements of projects authorized through Section 205 of the 1948 Flood Control Act, as amended, I further recommend that project authorization be contingent upon the willingness of local interests to provide the following items of local cooperation:

a. Provide a cash or in-kind contribution equal to 20 percent of the project first cost assigned to the flood damage prevention. Current estimates of the cost for the recommended alternatives is $73,770, which includes the local share of estimated relocation assistance cost;

b. Provide all government costs which exceed the statuatory limitations of government participation;

c. Accomplish, in accordance with the provisions of this report, all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements made necessary by project construction;

d. Hold and save the United States free from damages due to construction, operation and maintenance of the project, provided damages are not due to the fault or negligence of the United States or its contractors;

e. Maintain and operate the works after completion in accordance with regulations prescribed by the Secretary of the Army;

f. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to insure compatibility between future development and protection levels provided by the project.

B. E. Stalmann

BERNARD E. STALMANN
LTC, Corps of Engineers
District Engineer

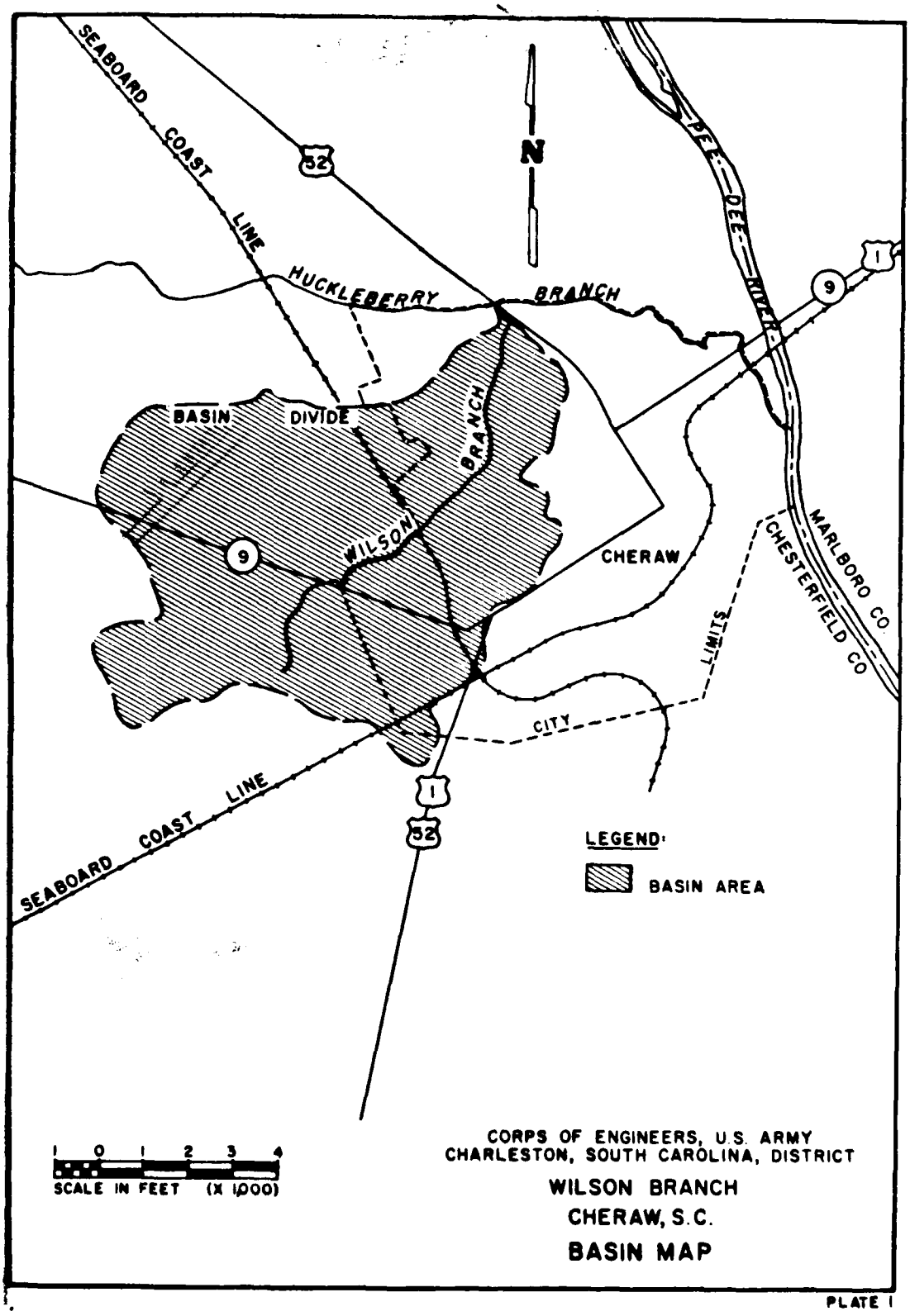
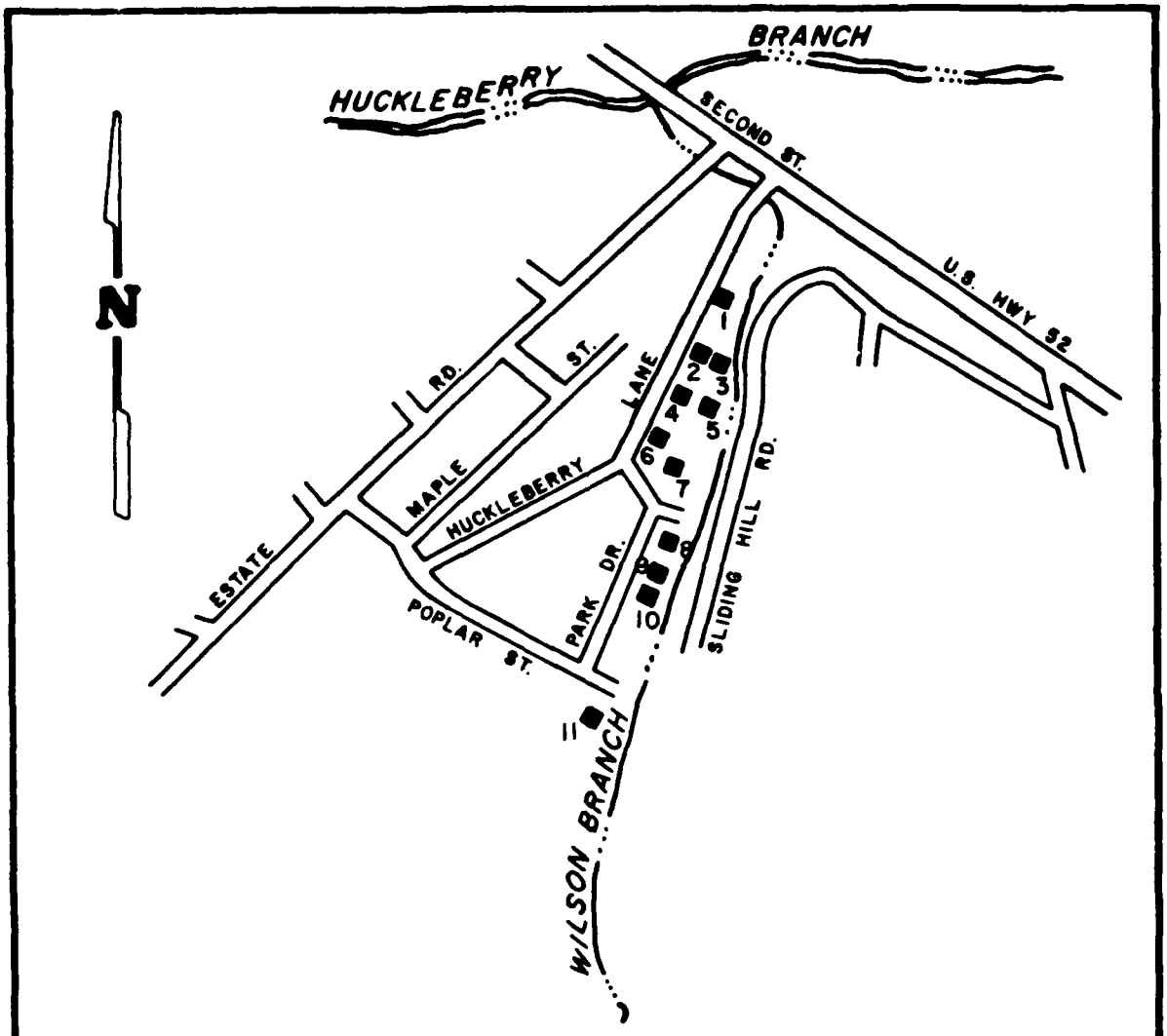

SEABOARD COAST LINE
52
N
PEE DEE RIVER
1
9
HUCKLEBERRY BRANCH
BASIN DIVIDE
WILSON BRANCH
9
CHERAW
CHESTERFIELD CO
MARLBORO CO
CITY LIMITS
1
52
SEABOARD COAST LINE
LEGEND:
BASIN AREA
1 0 1 2 3 4
SCALE IN FEET (X 1000)
CORPS OF ENGINEERS, U.S. ARMY
CHARLESTON, SOUTH CAROLINA, DISTRICT
WILSON BRANCH
CHERAW, S.C.
BASIN MAP

PLATE I



5 0 5

SCALE IN FEET (X 100)

CORPS OF ENGINEERS, U.S. ARMY
CHARLESTON, SOUTH CAROLINA, DISTRICT

WILSON BRANCH

CHERAW, S.C.

STUDY AREA

PLATE 2

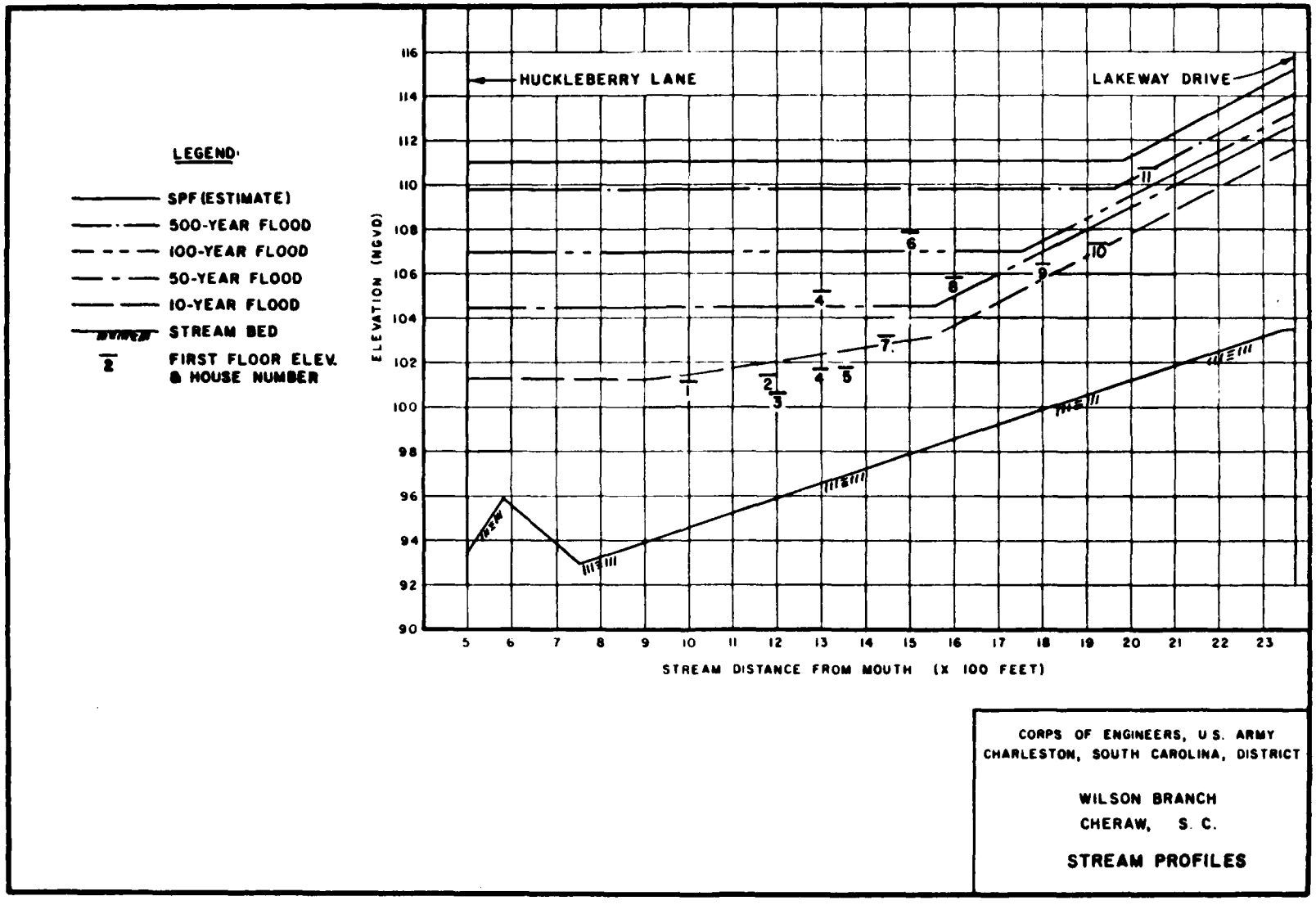

LEGEND
SPF (ESTIMATE)
500-YEAR FLOOD
100-YEAR FLOOD
50-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
FIRST FLOOR ELEV. & HOUSE NUMBER
HUCKLEBERRY LANE
LAKEWAY DRIVE
ELEVATION (NGVD)
STREAM DISTANCE FROM MOUTH (X 100 FEET)
CORPS OF ENGINEERS, U.S. ARMY
CHARLESTON, SOUTH CAROLINA, DISTRICT
WILSON BRANCH
CHERAW, S. C.
STREAM PROFILES

PLATE 3

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

Charleston District

APPENDIXES

DETAILED PROJECT REPORT

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

Charleston District

APPENDIX 1

WILSON BRANCH

CHESTERFIELD COUNTY, S C

HYDROLOGIC AND HYDRAULICS

APPENDIX 1

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HYDROLOGY AND HYDRAULICS

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LIST OF PLATES
(PLATES FOLLOW TEXT)

APPENDIX 1

HYDROLOGY AND HYDRAULICS

BASIN DESCRIPTION

1. Wilson Branch lies within the Yadkin-Pee Dee River Basin. It is a relatively short stream approximately two miles in length, with headwaters originating on the west side of the Town of Cheraw. Originating as an intermittent stream at the headwater, it develops into a perennial stream prior to its confluence with Huckleberry Branch. Normally the stream is narrow and shallow. Wilson Branch has a drainage area of 2.37 square miles and is located in the Piedmont province. The area surrounding Cheraw is hilly with an average elevation of 150 feet National Geodetic Vertical Datum (NGVD). It is dissected by small drainage basins such as Wilson Branch and Huckleberry Branch.

2. The Town of Cheraw is located in Chesterfield County in northeastern South Carolina adjacent to the Pee Dee River. Cheraw is located 61 miles southeast of Charlotte, North Carolina and 75 miles northeast of Columbia, South Carolina. The town is basically residential except for a downtown area consisting of small businesses and some small industrial plants. Wilson Branch lies almost wholly within the corporate limits of Cheraw. It flows in a generally northeast direction to its confluence with Huckleberry Branch, the northern city limit, then to the Pee Dee River approximately 1 3/4 miles away. Figure 1-1 is a basin map of the study area.

CLIMATOLOGY

3. Cheraw, located in the northeast portion of South Carolina has mild winters and hot summers. Temperatures drop below freezing on about 70 days but rarely reach 0^{0}. Temperatures reach 90^{0} on about 90 days. The area receives about 47 inches of precipitation per year. Figure 1-2 is a bar graph of monthly precipitation extremes for the National Weather Service rain gage at Cheraw, South Carolina. Table 1-1 lists the storms with rainfall at least 3.0" in one day.

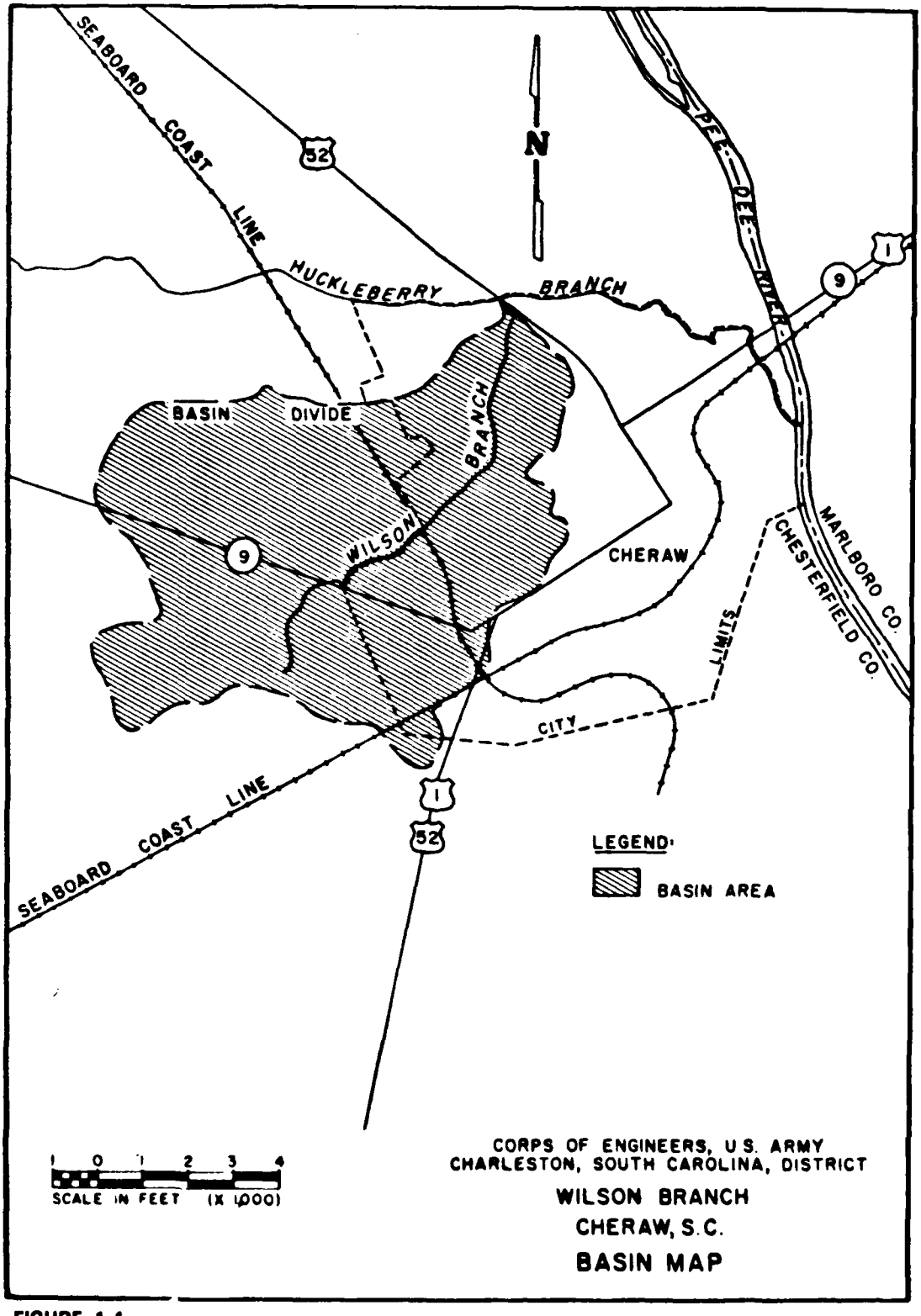

SEABOARD COAST LINE
52
N
PEE DEE RIVER
1
9
HUCKLEBERRY BRANCH
BASIN DIVIDE
WILSON BRANCH
9
CHERAW
MARLBORO CO.
CHESTERFIELD CO.
LIMITS
CITY
1
52
SEABOARD COAST LINE
LEGEND:
BASIN AREA
1 0 1 2 3 4
SCALE IN FEET (X 1,000)
CORPS OF ENGINEERS, U.S. ARMY
CHARLESTON, SOUTH CAROLINA, DISTRICT
WILSON BRANCH
CHERAW, S.C.
BASIN MAP

FIGURE 1-1

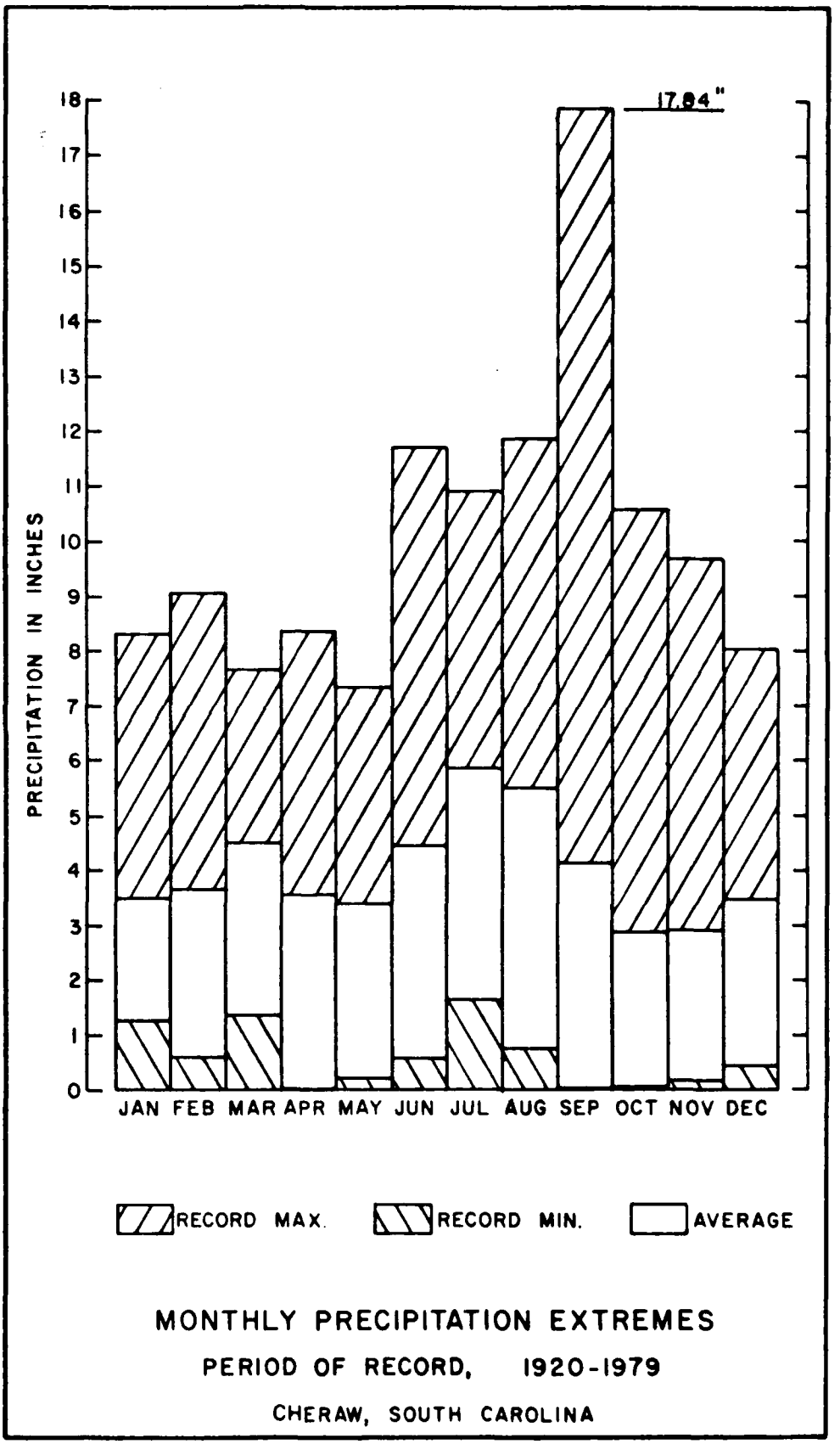

17.84"
PRECIPITATION IN INCHES
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
RECORD MAX.
RECORD MIN.
AVERAGE
MONTHLY PRECIPITATION EXTREMES
PERIOD OF RECORD, 1920-1979
CHERAW, SOUTH CAROLINA

FIGURE 1-2

TABLE 1-1

STORMS WITH RAINFALL AT LEAST 3.0 INCHES
IN ONE DAY

CHERAW, SOUTH CAROLINA
1920 - 1980

Date	Rainfall (Inches)	Date	Rainfall (Inches)
October 1, 1980	4.03	July 16, 1948	3.03
June 17, 1979	6.79	August 26, 1948	3.00
September 5, 1979	5.65	September 17, 1945	3.80
April 26, 1978	3.08	September 18, 1945	4.60
January 8, 1973	3.00	May 26, 1943	3.43
February 10, 1973	3.35	July 19, 1938	3.10
April 1, 1973	3.40	November 29, 1934	3.80
October 2, 1971	4.32	October 17, 1932	5.52
August 19, 1970	3.24	August 21, 1931	5.04
August 24, 1970	3.55	October 1, 1929	5.13
February 17, 1969	3.95	September 6, 1928	4.69
July 30, 1969	3.40	September 18, 1928	6.72
August 11, 1967	3.35	July 21, 1927	3.09
September 21, 1966	3.08	October 9, 1927	3.57
June 27, 1958	3.22	April 12, 1926	3.92
October 15, 1954	4.02	January 27, 1921	3.00
September 27, 1953	3.25	August 20, 1920	3.23
August 21, 1949	3.50		

4. Most of the houses in question along Wilson Branch were built in the mid 1960's. During this period flooding was reported in houses along the creek in July 1969, August 1970 and June 1979. Storms which caused erosion or flooded roads and yards were much more frequent.

5. The residents along Wilson Branch must also contend with flooding from the Pee Dee River which backs up Huckleberry and Wilson Branches. A brief description of the more severe storms of record for the Pee Dee River at Cheraw are discussed in the following paragraphs.

a. Storm of 27 February 1979. A severe winter storm on the 17th brought an accumulation of snow to this area. On the 22nd the temperatures climbed into the 60's causing melting with 5 days of heavy rain. This melted snow and rain caused the Pee Dee to crest on the 27th. The conditions produced an estimated peak discharge of 122,000 cfs.

b. Storm of 2 April 1973. Five days of heavy rainfall beginning on 29 March caused flooding along the Pee Dee River. The storm produced an estimated peak discharge of 106,000 cfs.

c. Storm of 19 September 1945. Precipitation was about two and a half times the norm for this month. The greatest portion of rainfall occurred between the 14th and the 18th, a period which included passage of a tropical storm on the 17th. The Pee Dee River crested at 107.3 feet NGVD. These circumstances produced an estimated peak discharge of 252,000 cfs.

d. Storm of 8 April 1936. Unusually heavy rain on the 5th to 7th caused river stages to be the highest since 1929. This storm produced an estimated peak discharge of 111,000 cfs.

e. Storm of 4 October 1929. The passage of a tropical storm on the 1st caused two days of excessive rain. This produced an estimated peak discharge of 110,000 cfs.

f. Storm of 20 September 1928. Heavy rains during the first part of the month with a tropical storm on the 17th to 19th brought heavy rainfall to this area. The month closed with the Pee Dee River still above flood stage. These conditions produced an estimated peak discharge of 141,700 cfs.

HYDROLOGY

GENERAL

6. It was decided early, that since all the proposed solutions for Wilson Branch were nonstructural, the hydrologic and hydraulic effort would not be as detailed as is normally required. It was requested by higher authority that a hydrologic basin model be constructed for the study area in an attempt to verify the discharges published in the Flood Insurance Study (FIS) for Wilson Branch by the U.S. Geologic Survey (USGS). In addition, a discharge-frequency analysis was performed on the USGS stream gage on the Pee Dee River at Cheraw.

RAINFALL-RUNOFF ANALYSIS

7. A hydrologic basin model was constructed and analyzed using a version of the Hydrologic Engineering Center's Computer Program, HEC-1, which Table 1-2 summarizes the basin parameters used in constructing the HEC-1 model for Wilson Branch. Land use and corresponding SCS curve numbers are listed on Table 1-3.

TABLE 1-2

BASIC HYDROLOGIC INFORMATION -- WILSON BRANCH
CHERAW, SOUTH CAROLINA

Soil Type	B
Basin Slope	4%
Watercourse	15250 Ft.
Drainage Area	2.37 sq. mi.
SCS Curve Number	74
SCS Lag	1.68 Hr.
Storm Duration	6 Hr.
Unit Time Interval	15 Minutes

TABLE 1-3

LAND USE AND SCS CURVE NUMBER (CN)
FOR WILSON BRANCH - CHERAW, SOUTH CAROLINA

LAND USE	PERCENT OF TOTAL	CN
Industrial	5	83
Meadow	20	71
Cultivated	15	78
Residential	20	79
Forest	30	70
Pasture	10	74
TOTAL	100	
Weighted CN		74

8. The Standard Project Storm rainfall was derived from EM 1110-2-1411 "Standard Project Flood Determinations". Other rainfall amounts were taken from the Weather Bureau's (now the National Weather Service) publication TP-40, "Rainfall Frequency Atlas of The United States". Table 1-4 lists the 6-hour rainfall frequency relationship. Table 1-5 is a listing of the actual rainfall distribution of the 6-hour Standard Project Storm (SPS). All other storms were directly proportional to this distribution.

TABLE 1-4

RAINFALL-FREQUENCY FOR SIX-HOUR STORM
FROM TP-40 AND EM 1110-2-1411
WILSON BRANCH, CHERAW, SOUTH CAROLINA

RETURN FREQUENCY	ADJUSTED RAINFALL[1/] (INCHES)
10-YR	4.0
25-YR	4.7
50-YR	5.2
100-YR	5.9
SPS	10.0

[1/] Adjusted for area and annual series.

TABLE 1-5

6-HOUR STANDARD PROJECT STORM DISTRIBUTION
TOTAL RAINFALL 10.0 INCHES

Time Hours	Rainfall (Inches)	Time Hours	Rainfall (Inches)
0:15	.1	3:15	2.4
0:30	.1	3:30	.6
0:45	.1	3:45	.5
1:00	.1	4:00	.4
1:15	.1	4:15	.3
1:30	.1	4:30	.2
1:45	.2	4:45	.1
2:00	.3	5:00	.1
2:15	.4	5:15	.1
2:30	.5	5:30	.1
2:45	.6	5:45	.1
3:00	2.4	6:00	.1

9. The basin model was used to estimate floods of 10-, 25-, 50-, 100-year and SPS magnitude. Figure 1-3 compares the frequency-discharge relationship for Wilson Branch from the Flood Insurance Study with this analysis. Table 1-6 lists the discharges from the Flood Insurance Study with those derived from the HEC-1 analysis. Due to the correlation between the two study results, it was decided the discharges had been verified, as was originally intended.

10. As improvements are completed upstream, discharges along Wilson Branch will increase. Future condition discharges were not considered for this report. Although the 10-year discharge from Wilson Branch is just under 800 cfs, the minimum required for Federal involvement, the area is affected by the backwater from the Pee Dee River. The 10-year event on the Pee Dee is estimated at 131,000 cfs.

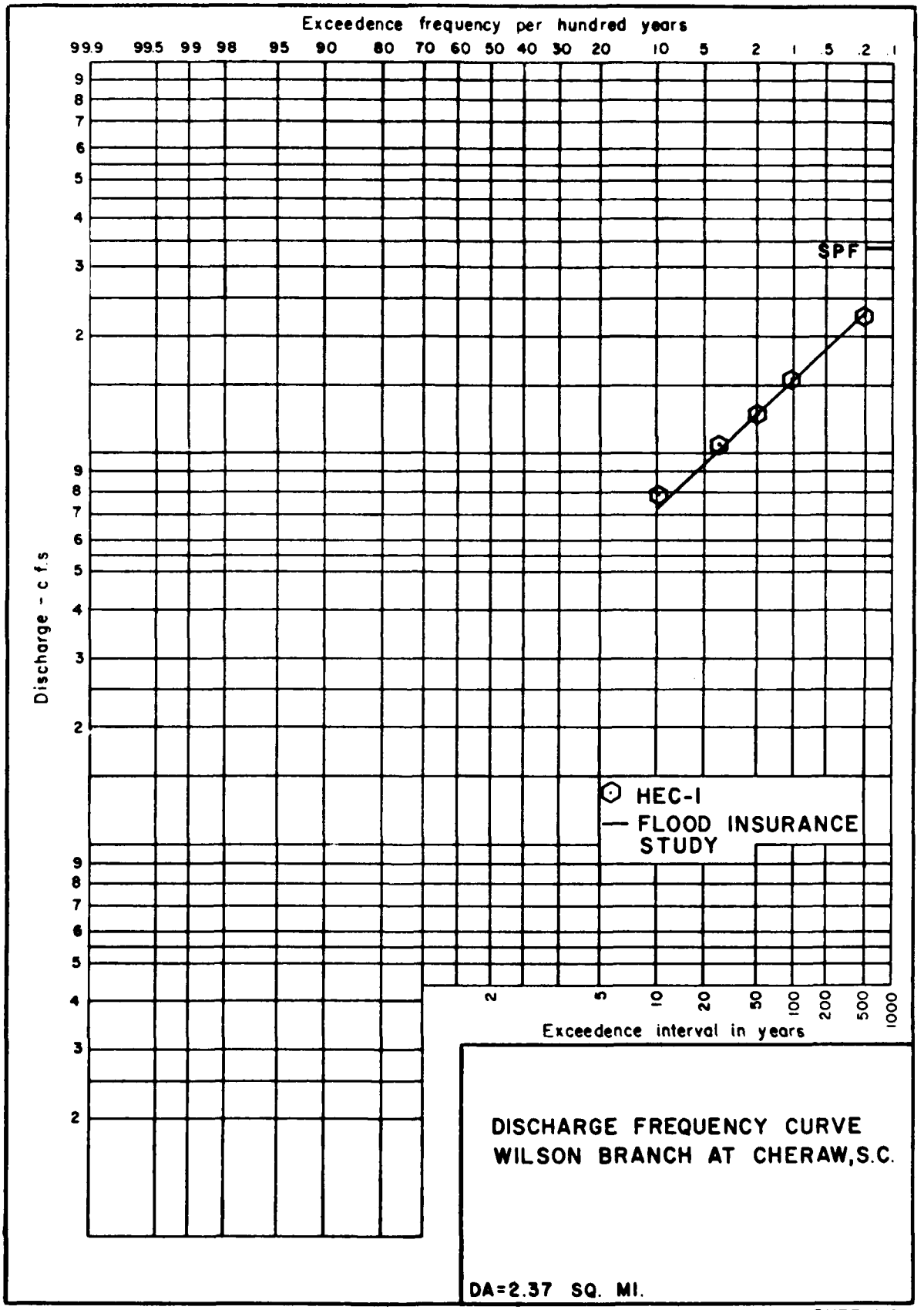

Exceedence frequency per hundred years
99.9 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 .5 .2 .1
Discharge - c.f.s
SPF
HEC-I
FLOOD INSURANCE STUDY
Exceedence interval in years
2 5 10 20 50 100 200 500 1000
DISCHARGE FREQUENCY CURVE
WILSON BRANCH AT CHERAW, S.C.
DA=2.37 SQ. MI.

FIGURE 1-3

TABLE 1-6

COMPARISON OF DISCHARGES
WILSON BRANCH - CHERAW, SOUTH CAROLINA

Return Frequency	FIS Discharge	HEC-1 Discharge
10-Yr	730	786
25-Yr	1020[1/]	1055
50-Yr	1300	1256
100-Yr	1500	1546
500-Yr	2300	2250[1/]
SPF	--	3367

[1/] Interpolated

Frequency Analysis

11. The U.S. Geological Survey (USGS) maintained a river gage on the Pee Dee River at Cheraw, South Carolina (Gage No. 02130000) from 1939 to 1964. There were no major hydrologic changes in the Pee Dee Basin during the period of record. This reach of the Pee Dee River during floods causes a backwater effect on Huckleberry Branch and Wilson Branch. Statistical Parameters were derived using the Hydrologic Engineering Center's computer program, Flood Flow Frequency Analysis. This program follows the guidelines published in Bulletin No. 17. For this study a regionalized skew of zero was used. Expected probability frequency curves were used as a basis for the project design.

Tables 1-7 and 1-8 list the discharge-frequency and the resulting stage-frequency relationship respectively for the Pee Dee River at Cheraw. Figure 1-4 is the discharge-frequency curve for this location.

12. The stage-frequency relationship is an estimate of the level of water which would back up on Wilson Branch during flooding of the Pee Dee River. This stage-frequency relationship agrees well with the results published in the Flood Insurance Study and was adopted for this study.

TABLE 1-7

DISCHARGE-FREQUENCY TABLE
PEE DEE RIVER AT CHERAW, SOUTH CAROLINA
DRAINAGE AREA = 7320 SQ. MI.

Return Frequency (Years)	Discharge From USGS Study (CFS)	Discharge From (CFS) & Corps of Engineers' Study
2	---	71,400
10	123,000	131,000
25	---	165,000
50	184,000	193,000
100	214,000	223,000
500	296,000	306,000

TABLE 1-8

STAGE-FREQUENCY TABLE
PEE DEE RIVER AT CHERAW, SOUTH CAROLINA

Return Frequency (Years)	Study By USGS Gage Height (NGVD)	Study By COE Gage Height (NGVD)
2	--	95.22
10	99.0	101.28
25	--	103.00
50	104.5	104.45
100	107.0	107.10
500	108.7	109.74

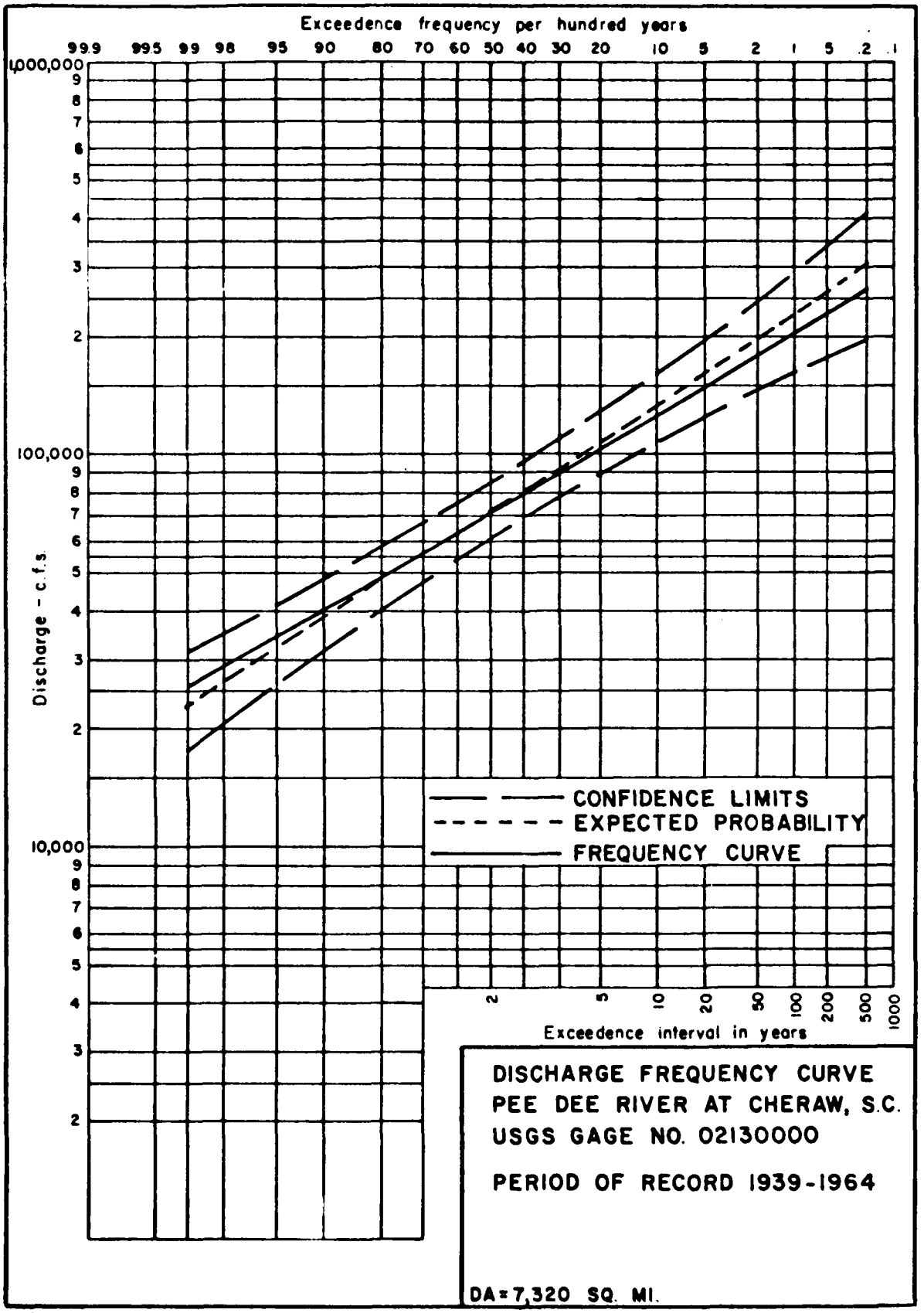
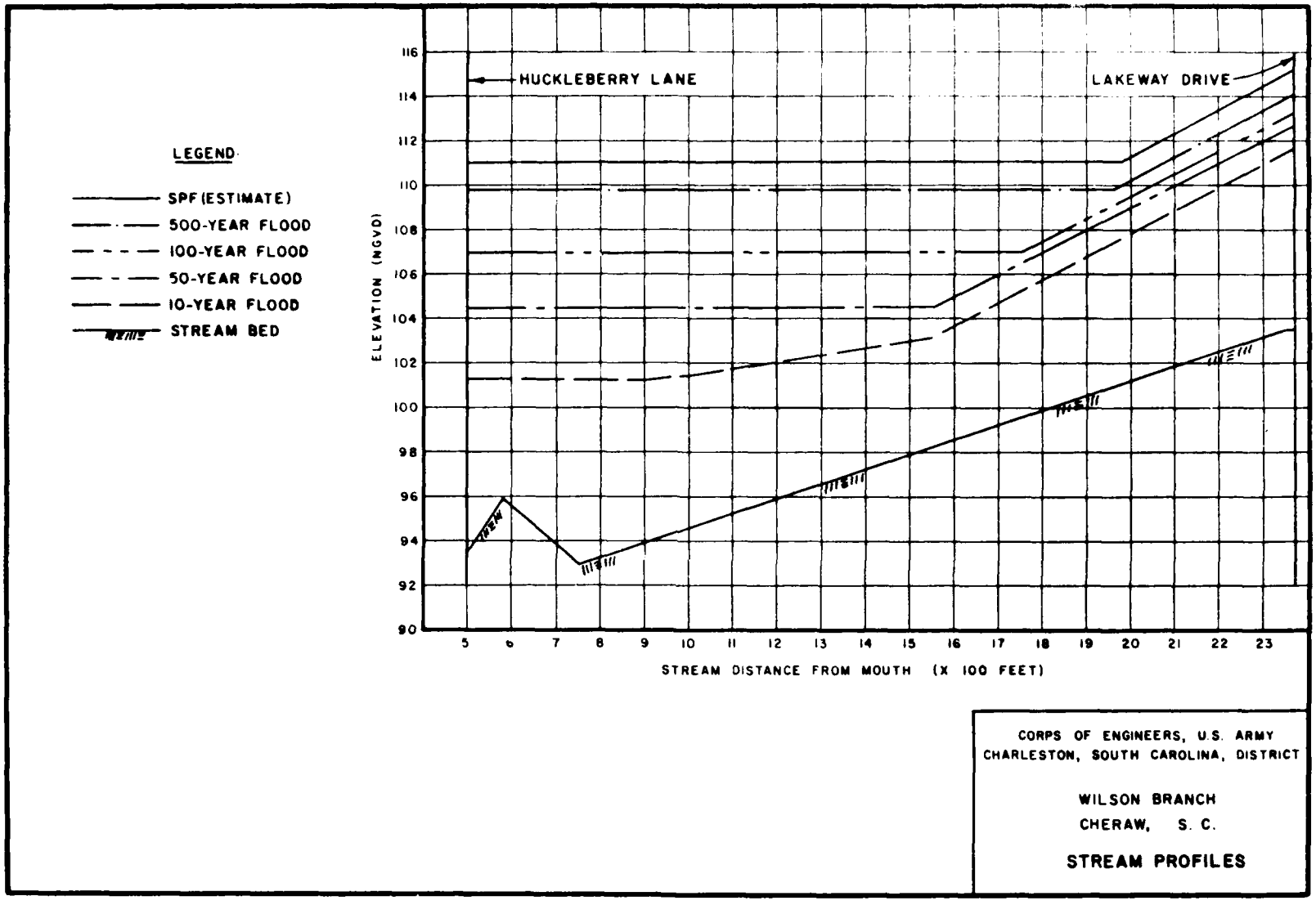

Exceedence frequency per hundred years
99.9 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 .5 .2 .1
1,000,000
100,000
10,000
Discharge - c.f.s.
CONFIDENCE LIMITS
EXPECTED PROBABILITY
FREQUENCY CURVE
2 5 10 20 50 100 200 500 1000
Exceedence interval in years
DISCHARGE FREQUENCY CURVE
PEE DEE RIVER AT CHERAW, S.C.
USGS GAGE NO. 02130000
PERIOD OF RECORD 1939-1964
DA = 7,320 SQ. MI.

FIGURE 1-4

FLOOD PROFILES

13. Figure 1-5 shows the stream profiles for the study reach of Wilson Branch. These profiles are adopted from the profiles which were published in the Flood Insurance Study for Cheraw, South Carolina prepared by USGS. Plate 1-1 shows the 10-year frequency flooded area for Wilson Branch. Plate 1-2 shows the SPF flooded area for Wilson Branch.

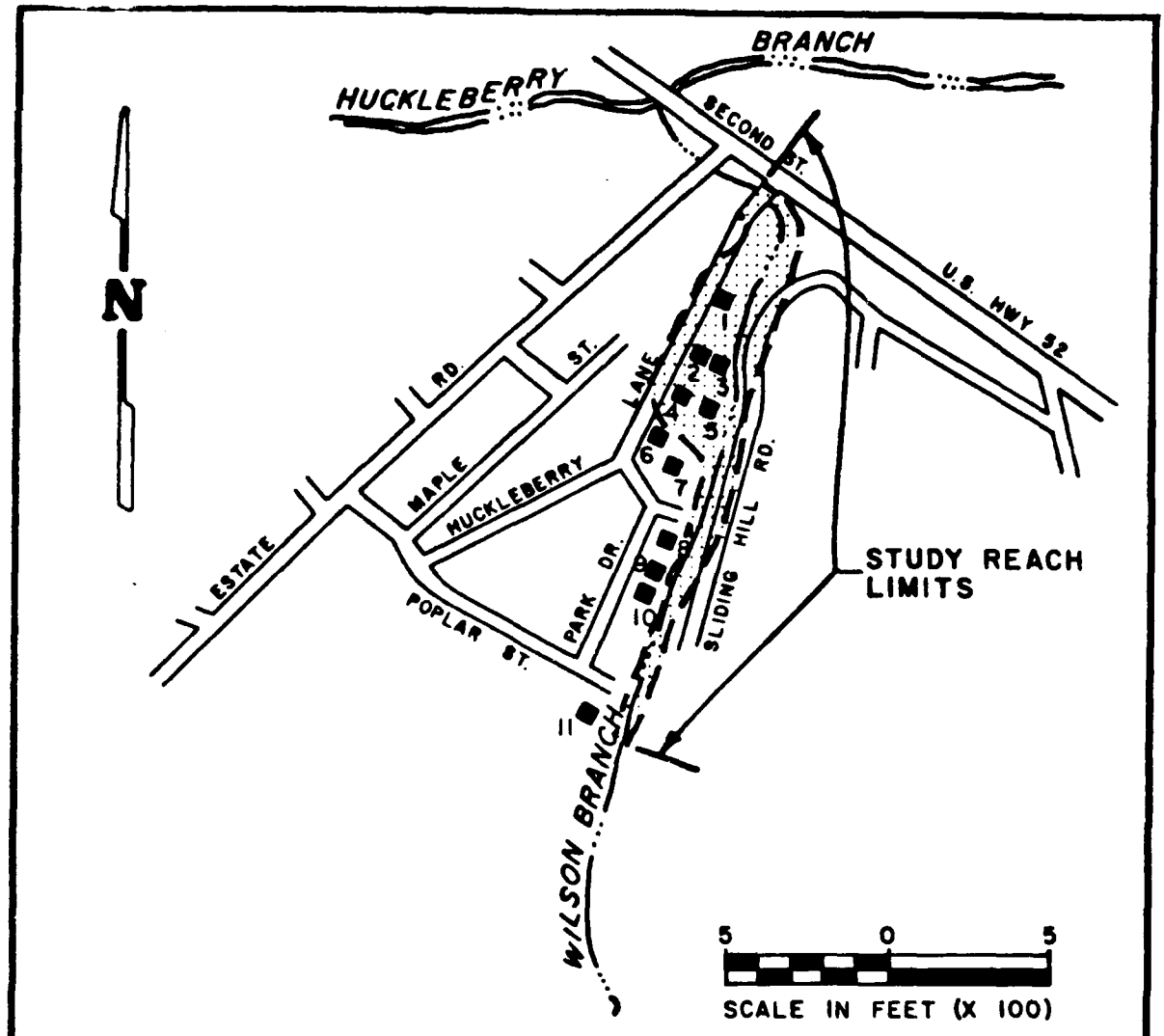
FIGURE 1-5



CORPS OF ENGINEERS, U.S. ARMY
CHARLESTON, SOUTH CAROLINA, DISTRICT

WILSON BRANCH
CHERAW, S. C.

STREAM PROFILES



LEGEND:

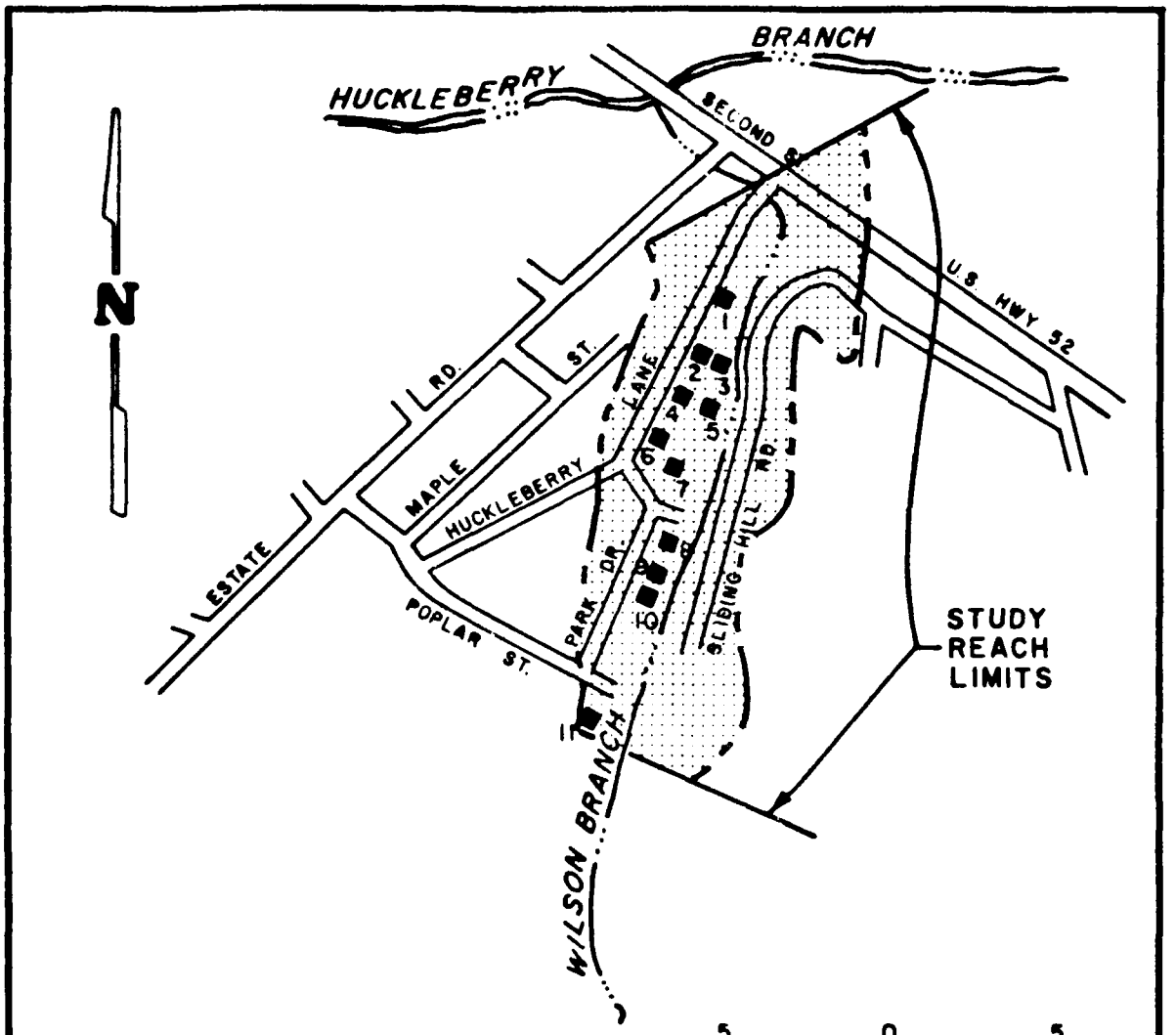
10-YEAR FLOOD

CORPS OF ENGINEERS, U.S. ARMY
CHARLESTON, SOUTH CAROLINA, DISTRICT

WILSON BRANCH
CHERAW, S.C.

STUDY AREA

PLATE 1-1



LEGEND:

SPF (ESTIMATE)

CORPS OF ENGINEERS, U.S. ARMY
CHARLESTON, SOUTH CAROLINA, DISTRICT

WILSON BRANCH
CHERAW, S.C.
STUDY AREA

PLATE 1-2

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

Charleston District

APPENDIX 2

WILSON BRANCH

CHESTERFIELD COUNTY, S C

ECONOMICS OF SELECTED PLAN

APPENDIX 2

TABLE OF CONTENTS

ECONOMICS OF THE SELECTED PLAN

LIST OF TABLES

LIST OF FIGURES

LIST OF EXHIBITS

APPENDIX 2

ECONOMICS OF THE SELECTED PLAN

1. The purpose of this section is to present detailed economic data used in measuring beneficial contributions to national economic development from the recommended flood hazard reduction plan. The material presented covers damages, benefits, and costs of the recommended plan.

INTRODUCTION

2. Economic feasibility of the plan was established by first computing equivalent average annual flood damages expected to occur if no corrective action is taken. (Without project condition). Then, damages were computed assuming that property within the flood plain at the elevation of selected storm frequencies would be evacuated. This identifies the residual damage which would remain if various property is evacuated. (With project condition). Benefits are calculated by subtracting the damage expected under with project conditons from that expected under without project conditions.

3. The values given to damages, benefits and costs at their time of accrual are made comparable by conversion to an equivalent time basis using an appropriate interest or discount rate. The interest rate of 7 5/8 percent annually was used in the formulation and evaluation. Future damages, benefits, and costs were discounted to the year 1983, assumed project completion date, and amortized over a 50-year period to arrive at the average annual equivalent figures.

4. Development of costs and benefits follows standard Corps of Engineers procedures. Estimated costs include the value of material, equipment, and services used in implementing the selected plan. Benefits are computed by using standard damage-probability relationships. Damage-probability values are derived from flood damage survey data and discharge-frequency, stage-discharge, stage-damage, stage-frequency, and damage-frequency relationships.

FLOOD DAMAGE

5. The following discussion of flood damage proceeds from a general description of the nature and extent of flood losses to the presentation of

detailed flood damage and average annual damage data. The procedure utilized in developing average annual equivalent values is also described.

Nature and Extent of Flood Losses

6. Flood damages along Wilson Branch are confined to the area between the Huckleberry Lane bridge and Lakeway Drive bridge. The primary flood losses are caused by inundation of single family residences. The first floor of eleven homes is below the elevation of the Standard Project Flood and the 500-year frequency flood. Five of these receive first floor flooding by the 8-year frequency flood.

7. Losses to residential property include damage to the main structure and auxiliary buildings, heating and cooling systems, electrical installations, and other fixed or built-in equipment. Contents subject to damage include such items as floor covering, appliances, household furnishings, mechanical and electrical equipment, and personal items.

Stage-Damage Relationships

8. Stage-damage relationships portray the probable damage that will occur under different depths of flooding. This can be expressed as either a percentage of the total value of damageable property or as the probable dollar loss expected.

9. Charleston District has developed depth-percent damage relationships for the types of residential structures and their contents which are most prevalent throughout South Carolina. These data were developed by detailed inspection of structures and contents. The detailed depth-damage information was based on known values of contents and structural components. Percent damage to structures was computed by determining replacement value or repair cost of damaged structural components for each foot of depth and dividing by total replacement value of the structure. Percent damage to residential contents was computed for each one foot increment of flooding by determining damages on a depreciated value basis and dividing by total replacement value of the contents. Depth-percent damage for the two types of residential structures and their contents which are found in this study are shown in Table 2-1.

TABLE 2-1

STAGE-DAMAGE FACTORS
RESIDENTIAL PROPERTY
WILSON BRANCH
SOUTH CAROLINA

Depth	Type of Structure and Damages			
	One Story No Basement		Split Level	
	Structure	Contents	Structure	Contents
Feet	%	%	%	%
-3	0.0	0.0	0.0	0.0
-2	3.2	0.0	0.0	0.0
-1	3.2	0.0	1.0	0.0
0 1/	8.7	6.0	4.7	7.8
1	15.0	38.0	7.2	12.1
2	21.7	49.0	9.7	15.2
3	28.5	63.0	11.2	17.9
4	35.2	71.7	14.6	20.0
5	39.7	74.0	17.9	27.4
6	41.2	74.4	21.7	30.1
7	42.1	75.0	24.9	32.2
8	46.3	75.7	27.8	34.3
9	50.0	77.2	32.8	36.0
10	51.3	80.0	34.8	45.5
11	52.3	83.5	36.6	55.9
12	54.2	85.0	39.8	66.2
13	57.5	86.0	41.6	75.3
14	61.5	86.5	43.2	77.6
15	66.5	87.0	44.6	78.3
16	72.5	88.0	46.6	79.1
17	80.0	90.0	48.7	80.0
18	83.5	92.5	50.0	82.0
19	84.2	95.5	53.0	86.0
20	84.7	100.0	55.0	100.0
21	85.0	100.0	56.0	100.0

1/ First Floor Elevation

10. The depth-percent damage data were integrated with hydrologic stage data to derive stage-damage for each structure at its respective mean sea level location along the stream profile. The actual damage at any depth can then be determined by multiplying the structure or content value by the percent figure at the selected depth.

Stage-Discharge Relationships

11. Stage-discharge relationships portray a stream's ability to carry flow at different depths. Stage is usually measured in elevations taken from mean sea level, while discharge is given in cubic feet per second. Engineering surveys were conducted to establish cross sections at selected points along the stream. For a flood of a given magnitude the stage-discharge relationship will tell how deep the flow will be at each cross section. Procedures used in establishing stage-discharge relationships are discussed in Appendix 1.

Discharge-Frequency Relationships

12. Discharge-frequency relationships describe the probable frequency of occurrence of varying streamflows. The methodology used in determining the relationships is described in Appendix 1.

Stage-Frequency Relationships

13. Stage-frequency relationships describe the probable frequency of occurrence in any year of streamflows reaching various mean sea level elevations. This relationship is established by combining data from the stage-discharge and discharge-frequency relationships. This is accomplished by selecting any point from these two relationships which have the same discharge and constructing the stage-frequency relationship from the corresponding points. Stage-frequency profiles for selected floods are shown in Figure 2-1.

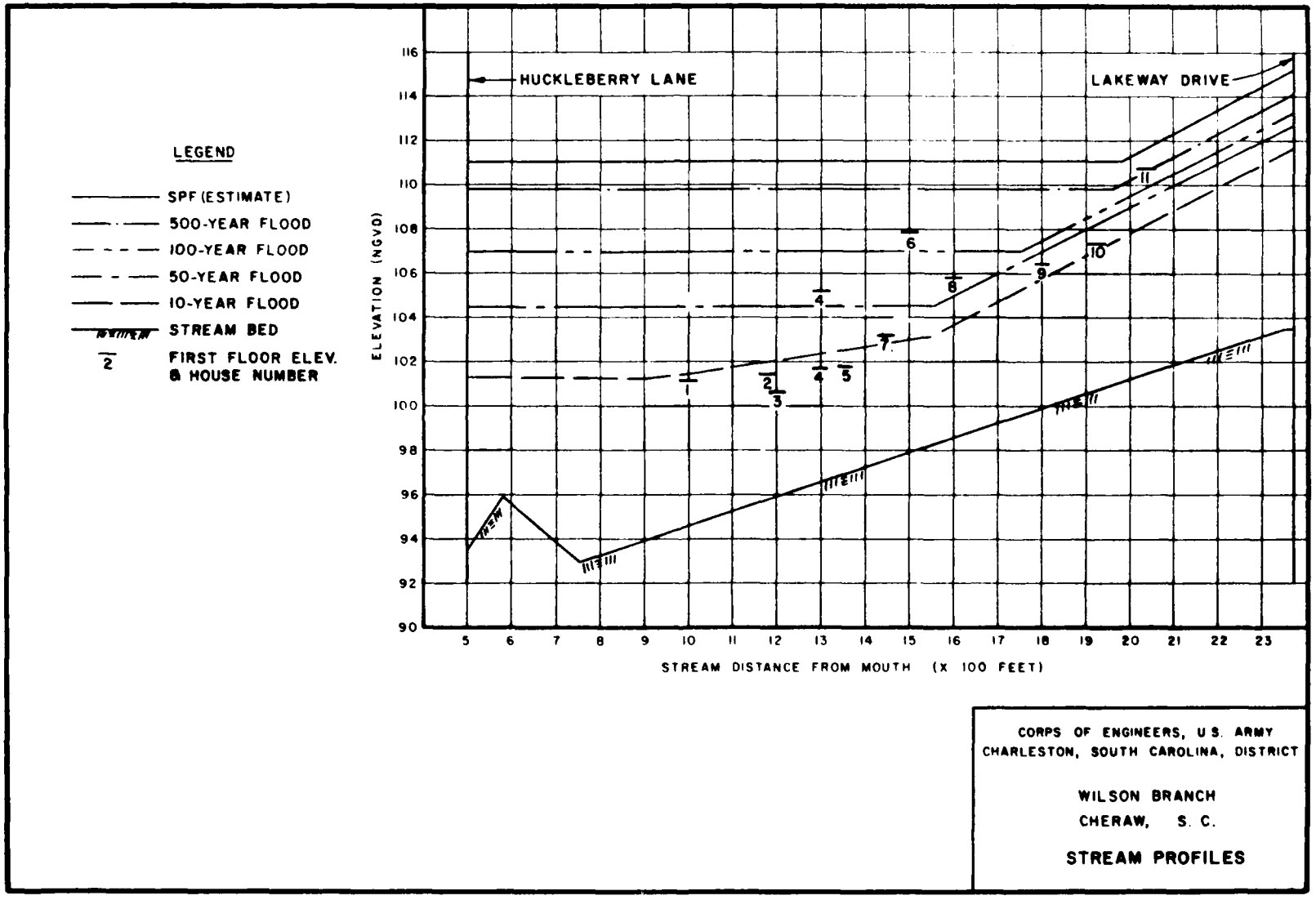

LEGEND
SPF (ESTIMATE)
500-YEAR FLOOD
100-YEAR FLOOD
50-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
2
FIRST FLOOR ELEV. & HOUSE NUMBER
HUCKLEBERRY LANE
LAKEWAY DRIVE
ELEVATION (NGVD)
116
114
112
110
108
106
104
102
100
98
96
94
92
90
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
STREAM DISTANCE FROM MOUTH (X 100 FEET)
CORPS OF ENGINEERS, U.S. ARMY
CHARLESTON, SOUTH CAROLINA, DISTRICT
WILSON BRANCH
CHERAW, S. C.
STREAM PROFILES

Figure 2-1

Damage-Frequency Relationships

14. Damage-frequency relationships portray the probable frequency of occurrence of flood damages of varying magnitudes. This is derived by combining the stage-damage and stage-frequency data. Average annual damages can then be estimated by plotting a curve from the damage-frequency data and calculating the area under the curve. Typical damage-frequency data is shown in Table E-1 of Exhibit 2-1. Average annual damage can also be computed mathematically. An example of this is shown in Table E-3 of Exhibit 2-1.

Equivalent Average Annual Damage

15. Employment of the relationships described above produces average annual damage for any given year. If this were the first year of a project evaluation period, and conditions remained the same in the future, this would be the equivalent average annual damage for the entire project life. However, it is common for conditions to change; i.e., damageable property in the flood plain may increase or decrease, urbanization upstream may cause increased runoff, or the channel itself may change. For these and other reasons it is necessary when analyzing flood damage over a period of time to compute expected annual damage for each year conditions change. This is accomplished by employing data for selected future years in the integration of the stage, damage, discharge, and frequency relationships. The average annual damage for each future year is then discounted back to the first year of the evaluation at a selected rate of interest and amortized over the entire period of analysis to arrive at the equivalent average annual damage.

Measurement of Flood Damage

16. Engineering surveys were conducted to establish the ground and first floor elevations of each structure located within the flood plain. The number of floors for each structure was recorded during the field survey. Each structure location was referenced on a map relative to its position along the stream profile.

17. The 1981 value of each property located in the flood plain was determined by a field survey conducted by personnel from Savannah District Real Estate Division. An informal survey was conducted to determine the value of contents. Based upon the occupant's judgement, it was determined that the average value of residential contents amounts to 50 percent of the structure values.

18. The value of residential contents per unit is expected to increase over time with increases in affluence (an increase in per capita income in real terms). Increases in content values during the evaluation period are projected on the basis of the anticipated growth of per capita income for Chesterfield County, South Carolina. Such increases are projected to continue until residential content values reach a maximum of 75 percent of structural value. The unit values of structures are not increased over time for affluence.

19. Participation in the Flood Disaster Protection Act of 1973 (P.L. 93-234) requires local adoption and certification by the Flood Insurance Administration of land use regulations that would require, as a minimum, that all new and replacement residential structures in the 100-year flood plain have the first floor elevated to or above the 100-year flood elevation. Chesterfield County and the Town of Cheraw are both participating in the regular flood insurance program.

20. The data and principles described heretofore are utilized as basic components of a computer program to calculate flood damage. This program analyzes each building individually to determine the expected depth of flooding for various flood events with particular recurrence intervals. Based on the location of the building along the stream profile, the type of building, its value, the depth-damage relationship for the type building, and the expected depth of flooding in relation to the first floor elevation, the expected damage to the building and its contents can be computed. Several single occurrence events are combined through the use of probability analysis to provide the average annual damage. The detailed methodology employed by this computer program is shown in Exhibit 2-1. It should be noted that since HEC-2 data were not available for this study, the elevations for the flood frequencies were extracted from the flood profiles shown in Figure 2-1.

Without Project Conditions

21. The primary problem caused by the flooding of Wilson Branch is the inundation of eleven single family homes and their complimentary property. No additional development is anticipated in the flood plain. However, damages are expected to increase in the future as the value of contents increases in the existing homes.

22. The 1981 value of the eleven houses is estimated to be $439,700. The current value of contents is estimated to be $219,850. This is expected to increase to $329,775 by the year 2003.

23. Floodwater inundation of these eleven properties currently causes average annual damages of approximately $31,900. This is expected to

increase to just over $36,500 annually by the year 2003. The type and amount of damage by decade is in Table 2-2.

TABLE 2-2

AVERAGE ANNUAL DAMAGE
WITHOUT PROJECT
($1000)

Type Damage	1981	1983	1993	2003-2033	Annual Equivalent
Structure Damage	19.87	19.87	19.87	19.87	19.87
Content Damage	9.33	10.23	13.69	13.99	12.85
Additional Damage	2.67	2.67	2.67	2.67	2.67
TOTAL DAMAGE	31.86	32.77	36.23	36.53	35.39

The damage which would result from a 500-year frequency flood is shown in Table 2-3.

TABLE 2-3

WITHOUT PROJECT FLOOD DAMAGE
500-YEAR FREQUENCY EVENT
($1,000)

Type Damage	1981	1983	1993	2003-2033
Structure Damage	154.44	154.44	154.44	154.44
Content Damage	134.77	147.82	197.82	202.15
Additional Damage	19.25	19.25	19.25	19.25
TOTAL DAMAGE	308.46	321.51	371.51	375.85

BENEFITS

24. The material presented herein provides the basis for establishing the economic benefits associated with the selected plan of action.

NONSTRUCTURAL MEASURES

25. Measures which modify flood damage susceptibility are classified as nonstructural. Evacuation is the only type of nonstructural measure recommended for flood damage reduction in this study. Evacuation consists of demolition or relocation of structures. Demolition is a procedure whereby occupants and contents are removed from flood-prone structures to structures ouside the flood plain area. The flood-prone structure is then demolished and removed from the flood plain. Relocation is the process whereby a structure is removed from a flood-prone area to a flood-free site and continues to be useful. Under either condition, the flood plain can then be used for purposes compatible with the flood hazard.

26. The recommended plan of action for Wilson Branch is to evacuate the five homes which are located within the limits of the 8-year flood plain. The first floor of the remaining six houses is above the 10-year frequency flood elevation.

27. One type of benefit from evacuation of the flood plain is the reduction in external costs associated with flood plain occupancy. Expressing savings in external costs as project benefits is appropriate for properties in communities which participate in the Federal Flood Insurance Program. This benefit is that portion of the without project damages which are not borne by the flood plain occupants. These benefits are calculated by taking the without project damage and subtracting amounts of losses to noninsurable items, the deductible damage of each flood event, the annual cost of the insurance premium paid by the policy holder, and for losses which exceed coverage limits.

27. Total benefits which will accrue as a result of demolishing these five houses amounts to $25,240 annually. The composition of these benefits are shown in Table 2-4.

TABLE 2-4

EVACUATION PLAN -- DEMOLITION
AVERAGE ANNUAL BENEFITS
($1,000)

Item	Base Year	Annual Equivalent
Total Damage Without Project	32.77	35.39
Residual Damage With Project	6.83	7.26
Total Damage Reduction	25.94	28.13
Encumbered Land Value	.99	.99
Noninsurable Losses	(-) .98	(-) .98
Deductible Losses	(-) 2.14	(-)2.19
Insurance Premium Costs	(-) .92	(-) .92
Insurance Operating Costs	.20	.20
Total Externalized Benefits	23.08	25.22

28. Further analysis was conducted to determine the feasibility of relocating the five houses to be evacuated. This would result in an additional annual benefit of $19,740. The option to relocate the houses will depend on the availability of suitable nonflood plain sites at the time of project implementation.

PROJECT FIRST COST

29. Evaluation of project first costs is in compliance with current Engineering Regulations. In general, the cost for demolishing flood plain structures includes the value of the structure and associated lands, the cost for demolishing the structure, and the cost of converting the evacuated site to a new use. The cost of relocating flood plain structures to flood-free sites includes the value of the structure and associated lands, the value of the relocation site, the cost to relocate the structure, and the cost of converting the evacuated site to a new use.

30. Building and land values are based on field appraisals conducted by personnel from the Savannah District Real Estate Division. These values are in 1981 dollars. Estimates of demolition and relocation costs are based on data developed by Charleston District for similar studies. These costs are based on 1981 dollars. A detailed itemization of cost estimates is shown in Table 2-5. It can be seen that the first cost for demolition would be about $268,900 and $516,000 for relocation.

31. An additional cost associated with nonstructural measures results from relocating affected families to nonflood plain sites. These costs are considered as financial costs to be shared by non-Federal interests, but not included in economic cost analysis. For this investigation an estimate of $20,000 per family was used. This information was supplied by Savannah District Real Estate Division personnel who based this estimate on similar costs at the Cooper River Rediversion Project. This would amount to a total cost of $100,000 for the five houses.

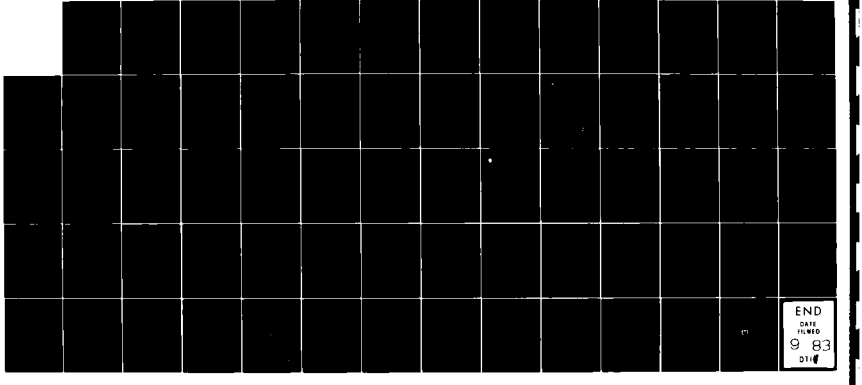
ANNUAL PROJECT COST

32. Estimates of annual costs are based on a 50-year evaluation period. Interest during project implementation was not included since the evacuation process is expected to take less than one year. The investment cost thus equals the first cost. Interest and amortization charges are based on an interest rate of 7 5/8 percent. The average annual cost for demolition amounts to $21,040. This would increase to $40,360 if the structures are relocated.

AD-A132 432 DETAILED PROJECT REPORT AND ENVIRONMENTAL ASSESSMENT WILSON BRANCH CHESTERFIELD COUNTY SOUTH CAROLINA(U) CORPS OF ENGINEERS CHARLESTON SC CHARLESTON DISTRICT JUN 82 F/G 13/2 NL

2/2

UNCLASSIFIED



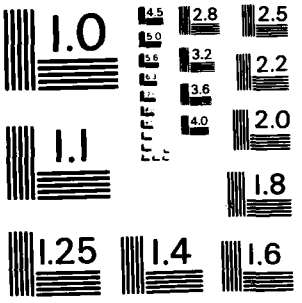


TABLE 2-5

DETAILED COST ESTIMATE
EVACUATION PLAN
($1,000)

ITEM	FIRST COST Demolition	FIRST COST Relocation
Building Purchase	194.60	194.60
Land Purchase	23.50	23.50
Acquisition Cost	15.27	15.27
Demolition Cost	15.00	--
Site Restoration Cost	2.50	2.50
Subtotal	250.87	235.87
Contingencies -- 0.20	11.25	8.25
Subtotal	262.12	244.12
Engineering and Design -- 0.06	15.73	14.65
Supervision and Administration -- 0.04	10.48	9.76
Subtotal	288.33	268.53
Salvage	19.46	--
Relocation Land Purchase	--	29.55
Acquisition Cost Relocation Sites	--	2.07
Development Cost Relocation Sites	--	12.50
Property Resale Cost	--	15.69
Building Moving Cost	--	127.62
Subtotal	268.87	455.96
Contingencies Relocation -- 0.20		37.49
Subtotal	268.87	493.45
Engineering and Design -- 0.06		13.50
Supervision and Administration -- 0.04		9.00
TOTAL COST	268.87	515.95

BENEFIT TO COST COMPARISON

33. As can be seen in Table 2-6, the evacuation of five houses from the flood plain is justified by either demolishing the structures or relocating them to flood-free sites. This table also shows that each solution would be justified with only base year benefits. The future benefits are attributable to increased content values as a result of affluence. It is also shown that net benefits are slightly greater for the relocation option as opposed to demolition.

TABLE 2-6

BENEFIT/COST COMPARISON EVACUATION
($1,000)

Evacuation	Average Annual Benefits			Average Annual Cost	Benefit Cost Ratio
	Base Year	Future	Total		
Demolition	23.08	2.14	25.22	21.04	1.20 to 1.00
Relocation	42.82	2.14	44.97	40.36	1.11 to 1.00

SENSITIVITY ANALYSIS

Value of Contents

34. The preceding sections of this Appendix have shown a comparison of damages, benefits, and costs under the assumption that residential contents are equal to 50 percent of the structure value as determined by informal interview. An analysis was also conducted using the assumption that content values would be equal to 40 percent of the structure value. This revealed that both evacuation options would still be justified under base year conditions.

Break-Even Years

35. As can be seen in Table 2-6 the annual project benefits will exceed the annual project costs in the base year of operation using undiscounted annual values.

COST ALLOCATION

37. All costs associated with the implementation of the proposed plan have been allocated to flood control.

COST APPORTIONMENT

38. Apportionment of costs between Federal and non-Federal agencies for nonstructural alternatives is in general compliance with Section 78 of the Water Resources Development Act of 1974. Subject act provides that non-Federal participation in the cost of recommended nonstructural measures shall be comparable to the value of lands, easements and rights-of-way which would have been required of non-Federal interests for structural local protection measures, but in no event shall exceed 20% of the project costs. Because of the difficulty in determining the appropriate structural alternative and the fact that in some cases there may be no feasible structural alternative, it is impractical to specify on a case-by-case basis what the "comparable" cost sharing would be for nonstructural measures. Accordingly, consistent with average cost-sharing on traditional local protection projects, the non-Federal share of costs for recommended nonstructural measures has been recommended in all cases to be 20 percent of the first cost of such measures, thereby assuring comparability to the average value of lands, easements and rights-of-way required for Corps structural protection projects. Following this criteria, the apportionment of project cost would be as follows:

ITEM	First Cost (100%)	Federal Cost (80%)	Local Cost (20%)
Demolition Plan	$268,870	$215,096	$ 53,774
Relocation Plan	$515,950	$412,760	$103,190

METHODOLOGY FOR FLOOD DAMAGE DETERMINATION

Flood Elevations

Flood elevations are obtained for various cross-sections along the stream from the HEC-2 output. These flood elevations represent the expected water surface elevation at a particular stream location (identified as a stream station) for certain frequencies of recurrence. Given the channel bottom elevation (or invert) the depth of flooding can be determined above the stream channel bottom at each cross-section obtained. By logarithmic interpolation of the flood elevations obtained from the HEC-2 output, other intermediate flood elevations can be determined as needed. Given sufficient cross-sections the various flood elevations can be determined at sufficient locations along the stream to reasonably reflect the expected flood profile for any given event. By interpolating linearly between cross-sections the expected flood elevations can be determined at any point or station along the stream.

Building Location

A building can be defined by its stream station location along the stream and its first floor elevation. This ties the building location to the same reference points as the flood elevations. It should be noted that because of this somewhat simplistic approach (as opposed to a grid coordinate spatial location), judgement must be exercised in assigning a stream station to a building location. In this manner the stream station location of the building (hereafter referred to as building station) is selected so that flood elevations at that stream station would reflect probably conditions at the building location.

Depth of Flooding

The depth of flooding for a particular building that is associated with various frequency floods is determined by first locating the building station in reference to the appropriate cross-section stations. If the building station equals a cross-section station, the flood elevations for the building are set equal to the flood elevations for the cross-section. If the building station is located between two cross-sections, then the flood elevations for the building are determined by linear interpolation between the nearest upstream and downstream cross-sections.

Once the flood elevations for the building are determined, flood depths can be determined by merely subtracting the first floor elevation of the building from the flood elevations for the building. Thus, negative results would indicate that the flood level is below the first floor level while positive results would indicate that the flood level is above the first floor.

Flood Damage

The flood damage analysis assumes that there is for any one particular type of structure, or building, a definable relationship that correlates depth of flooding to percent of total value actually damaged. Also, it is assumed that this relationship holds constant through time even though the frequency of flooding may change and the value of the structure or contents may increase. Thus, the percent of total value damaged is dependent only on depth of flooding. Given these assumptions, relationships between depth of flooding and percent of damage can be derived through theoretical or actual experience or obtained from other reliable sources, e.g. Federal Insurance Administration.

Flood damages to a building can then be determined by obtaining the appropriate percent of damage values that correspond with the expected flood depths and multiplying them by the appropriate building or content value. Additional damages may be added in depending on site conditions and general characteristics of flooding and damage which may not be reflected in the percent damage curves. By summing the structural, content, and additional damage for each event the total expected flood damage for that particular event can be determined. If the frequency of the flood event is known, then the expected average annual damage can be determined by applying the appropriate probability factor.

Future Flood Damage

At times, conditions are such that continuing development of the watershed or changes in existing development is expected to cause higher flood elevations in future years for a particular frequency flood. In order to reflect this changing condition in the flood damage analysis, another HEC-2 output can be obtained. From this, the new flood elevations can be obtained and used to compute flood damages. These future damages can be brought back to present worth by using an appropriate discount rate.

Example Flood Damage Calculation

An example is provided below of the analysis the program makes in determining flood damage to a particular building in the flood plain.

For this example a building will be analyzed following the step-by-step analysis of the program. The necessary data and calculations are described below:

a. Building - Type - 1 - one story, single family residence

Location - Station	12+00
First Floor elevation	100.7
Structural Value	$36,100
Content Value	$18,050

b. Nearest upstream cross-section - station 13+00
Nearest downstream cross-section - station 11+80
(Cross-section refers to HEC-2 cross sections)

c. Flood elevation - frequency data:

Station	11+80	13+00
Channel bottom elevation	95.8	96.6
Low bank elevation	98.9	99.3
2-Yr flood elevation	100.3	100.7
10-Yr flood elevation	102.0	102.4
25-Yr flood elevation	103.5	103.6
50-Yr flood elevation	104.6	104.6
100-Yr flood elevation	106.0	106.0
SPF flood elevation	111.0	111.0

(From HEC-2 output)

d. Interpolation-
Multiplication factor = (1200-1180)/(1300-1180)=20/120=0.16667
Stage-frequency data at station of building

Station	12+00
Channel bottom elevation	= 95.8+(96.6-95.8) X .016667 = 95.9
Low bank elevation	= 98.9+(99.3-98.9) X .016667 = 99.0
2-Yr flood elevation	= 100.3+(100.7-100.3) X .016667 = 100.4
10-Yr flood elevation	= 102.0+(102.4-102.0) X .016667 = 102.1
25-Yr flood elevation	= 103.5+(103.6-103.5) X .016667 = 103.5
50-Yr flood elevation	= 104.6+(104.6-104.6) X .016667 = 104.6
100-Yr flood elevation	= 106.0+(106.0-106.0) X .016667 = 106.0
SPF flood elevation	= 111.0+(111.0-111.0) X .016667 = 111.0

e. Determination of intermediate flood elevations

The intermediate flood elevations for the 1-, 4-, 8-, 15-, 20-, 30-, 40-, 60-, 80-, and 500-year events are determined using the logs of the time period as shown below:

15-yr flood elevation = 102.1+ (log 15.0 - log 10.0)/(log 25.0 - log 10) X (103.5-102.1) = 102.1+ (0.442X1.4) = 102.7

Table E-1 provides a listing of each flood elevation for existing hydrologic conditions.

f. The actual depth of flooding for each event can then be determined by subtracting the floor elevation from the flood elevation. Thus the flood depth for the 4-year flood is:

4-Yr Flood Depth = 101.1 - 100.7 = 0.4

The flood depths for each event are shown in Table E-1.

g. Based on the above established depths of flooding the damage can be determined based on the type of building and a depth-damage relationship. A depth-percent damage relationship for a single story residence is shown in Table E-2. The structural and content damage are calculated as shown below:

STRUCTURAL DAMAGE	=	STRUCTURAL VALUE	X	PERCENT DAMAGE
CONTENT DAMAGE	=	CONTENT VALUE	X	PERCENT DAMAGE

The program uses straight line interpolation to calculate damages at the elevation of each flood event. Table E-1 lists the structural and content damage for each event. It should be noted that when the flood elevation is less than the low bank elevation, then all damage to the building for that flood event are set equal to zero, (i.e. no damage is incurred until flood water exceeds channel capacity).

h. Additional damage to the building is calculated in terms of additional items that may be incurred in the building if flooded. Types of additional damage that may be included are listed below:

Yard damage	- $300[1/]
Temporary evacuation cost	- $500
Building Cleanup	- $500
Damage to cars	- $1000
Probability of car damage	- 0.25
Other damage	- $200

NOTE:
1/ These values are variable.

Total additional damage: 300+500+500+1000(0.25)+200 = $1,750

This is shown on Table E-1 as being added only when the flood depths are positive. Also, when the building has more than one unit, this additional damage is added per unit.

TABLE E-1
EXAMPLE
FLOOD DAMAGE CALCULATION

Flood Frequency (years)	Flood Elevation in Feet NGVD	Flood Depth in Relation to First Floor (ft)	Flood Damage			Additional Damage $	Total Flood Damage $
			Structure $	Contents $	Total $		
1000	111.0	10.3	18,630	14,639	33,260	1,750	75,010
500	109.8	9.1	18,110	14,000	32,110	1,750	33,860
100	107.1	6.4	15,000	13,470	28,470	1,750	30,220
80	106.3	5.6	14,650	13,400	28,050	1,750	29,800
60	105.3	4.6	13,610	13,170	26,780	1,750	28,530
50	104.6	3.9	12,470	12,780	25,250	1,750	27,000
40	104.2	3.5	11,610	12,230	23,840	1,750	25,590
30	103.8	3.1	10,500	11,510	22,010	1,750	23,760
25	103.5	2.8	9,800	10,870	20,670	1,750	22,420
20	103.2	2.5	8,960	10,000	18,960	1,750	20,710
15	102.7	2.0	7,880	8,900	16,780	1,750	18,530
10	102.1	1.4	6,380	7,650	14,030	1,750	15,780
8	101.9	1.2	5,810	7,180	12,990	1,750	14,740
4	101.1	0.4	4,120	3,580	7,700	1,750	9,450
2	100.4	-0.3	2,550	760	3,310	0	3,310
1	99.8	-0.9	1,370	120	1,490	0	1,490

TABLE E-2

STAGE-DAMAGE RELATIONSHIP
ONE STORY RESIDENTIAL STRUCTURE

DEPTH (feet)	PERCENT DAMAGE	
	Structure	Contents
-3	0.0	0.0
-2	3.2	0.0
-1	3.2	0.0
0 1/	8.7	6.0
1	15.0	38.0
2	21.7	49.0
3	28.5	63.0
4	35.2	71.7
5	39.7	74.0
6	41.2	74.4
7	42.1	75.0
8	46.3	75.7
9	50.0	77.2
10	51.3	80.0
11	52.3	83.5
12	54.2	85.0
13	57.5	86.0
14	61.5	86.5
15	66.5	87.0
16	72.5	88.0
17	80.0	90.0
18	83.5	92.5
19	84.2	95.5
20	84.7	100.0
21	85.0	100.0

1/ First Floor Elevation

i. The next step in the damage calculation is the determination of the average annual damage to the building. This is shown on Table E-3 to be $7,655 for the total damage only for existing hydrologic conditions. The program calculates the average annual damage for each type of damage listed above. The incremental frequency shown for the SPF is obtained by taking the estimated frequency of the SPF, inserting it, and subtracting that from 0.002 (in ex., 1,000 years).

As noted earlier, the options available in the program permit the analysis of changing conditions through time. The program is designed to analyze both present and future conditions sequentially and in such fashion as to show the effects on potential flood damage through time. This is done through entering the future sets of HEC-2 flood elevation data along with the existing set of data. Once the analysis of the existing conditions is completed, as above, the program automatically steps to the next set of flood data and repeats the process. If three sets of data are entered, then a third analysis is run when the second is complete and so on.

In this example, the hydrologic conditions are not expected to change during the life of the project. Thus, flood damage throughout the life of the project will not change unless there is an increase in the value or amount of property in the flood plain. In this example, the value of contents is projected to increase in the future. Affluence factors are used to increase the existing value of contents through time. An example is shown as follows:

1981 - Value of structure - $36,100
1981 - Value of Contents - $18,050
1983 - Base year affluence factor - 0.0968
1993 - Affluence factor - 0.4678
2003 - Affluence factor - 0.9794

Value of Contents:

1981 - $18,050
1983 - $18,050+ (18,050X.0968) = $19,797
1993 - $18,050+ (18,050X.4678) = $26,494
2003 - $18,050+ (18,050X.9794) = $35,728

Since the future value of contents is not allowed to exceed 75 percent of the structure value the content value for the year 2003 and the remainder of the project life would be limited to $27,075. Based on these determinations, the average annual damage by decade would be as follows:

TABLE E-3

EXAMPLE
AVERAGE ANNUAL DAMAGE COMPUTATION

Frequency (Years)	Exceedence Frequency Events Per 100 Years	Probable Occurrence	Incremental Probability	Stage in ft. NGVD	Damages 1981 Dollars Total	Damages 1981 Dollars Average	Incremental Annual Flood Damages $	Accumulated Annual Flood Damages $
			.0010			35,010	35	7,655
1000	.1	.0010		111.0	35,010			
			.0010			34,435	34	7,620
500	.2	.0020		109.8	33,860			
			.0080			32,040	256	7,586
100	1.0	.0100		107.1	30,220			
			.0025			30,010	75	7,330
80	1.25	.0125		106.3	29,800			
			.0042			29,165	123	7,255
60	1.67	.0167		105.3	28,530			
			.0033			27,765	92	7,132
50	2.0	.0200		104.6	27,000			
			.0050			26,295	131	7,040
40	2.5	.0250		104.2	25,590			
			.0083			24,675	205	6,909
30	3.33	.0333		103.8	23,760			
			.0067			23,090	155	6,704
25	4.0	.0400		103.5	22,420			
			.0100			21,565	216	6,549
20	5.0	.0500		103.2	20,710			
			.0167			19,620	328	6,333
15	6.67	.0667		102.7	18,530			
			.0333			17,155	571	6,005
10	10.0	.1000		102.1	15,780			
			.0250			15,260	382	5,434
8	12.5	.1250		101.9	14,740			
			.1250			12,095	1,512	5,052
4	25.0	.2500		101.1	9,450			
			.2500			6,380	1,595	3,540
2	50.0	.5000		100.4	3,310			
			.5000			2,400	1,200	1,945
1	100	1.0000		99.8	1,490			
			1.0000			745	745	745
.5	200	2.0000		-	0			

APPENDIX 2
Exhibit 2-1

	1981	1983	1993	2003	2013	2023	2033
Average Annual Damage	$7,655	$6,920	$8,930	$9,020	$9,020	$9,020	$9,020

12. The above average annual damages are converted to an annual equivalent damage using an appropriate discount rate. For a rate of 7 5/8% the computer would determine the annual equivalent damage as follows:

YEAR					
1983 -	7920	X	1	=	$7,920
1993 -	(8930 - 7920)	X	0.727639	=	735
2003 -	(9020 - 8930)	X	0.335420	=	30
2013 -	(9020 - 9020)	X	0.147317	=	0
2023 -	(9020 - 9020)	X	0.057104	=	0
2033 -	(9020 - 9020)	X	0.013839	=	0
	ANNUAL EQUIVALENT DAMAGE				$8,685

APPENDIX 2
Exhibit 2-1

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

Charleston District

WILSON BRANCH

CHESTERFIELD COUNTY, S C

APPENDIX 3

ENVIRONMENTAL CONCERNS AND COORDINATIONS

APPENDIX 3

ENVIRONMENTAL CONCERNS AND COORDINATION

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APPPENDIX 3

ENVIRONMENTAL CONCERNS AND COORDINATION

1. The purpose of this appendix is to summarize environmental data utilized to evaluate the impact of various flood control measures on Wilson Branch and to present pertinent correspondence received by study coordination efforts. Section 1 presents material covering environmental values of the study area and expected impacts, both favorable and unfavorable, resulting from implementation of the recommended plan. An Environmental Assessment is presented in the main report, and the required Fish and Wildlife Coordination Act Report is included in Section 1 of this appendix.

2. Section 2 includes pertinent correspondence received from various agencies including the letter of intent for local sponsorship by the Town of Cheraw. Memorandums covering coordination meetings are also included in Section 2.

SECTION 1 - ENVIRONMENTAL CONCERNS

GENERAL

3. The Town of Cheraw is located in Chesterfield County in northeastern South Carolina adjacent to the Pee Dee River. Cheraw is located 61 miles southeast of Charlotte, North Carolina and 75 miles northeast of Columbia, South Carolina. The town is basically residential except for a downtown area consisting of small businesses and some small industrial plants. Wilson Branch lies almost entirely within the corporate limits of Cheraw. It flows in a generally northeast direction to its confluence with Huckleberry Branch, the northern town limit, then to the Pee Dee River approximately 1 3/4 miles away. Its drainage area above its confluence with Huckleberry Branch is 2.37 square miles. The study area is confined to a 1,500-foot reach of Wilson Branch located between points 500 and 2,000 feet upstream from the confluence with Huckleberry Branch. Only eleven houses are adversely affected by flooding. They are all located within 150 feet of the branch along Huckleberry Lane, Park Drive, Sliding Hill Road and Poplar Street.

4. Wilson Branch lies within the Yadkin-Pee Dee River Basin. It is a relatively short stream approximately two miles in length, with headwaters originating on the west side of the Town of Cheraw. Originating as an intermittent stream at the headwater, it develops into a perennial stream prior to its confluence with Huckleberry Branch. Normally, the stream is narrow and shallow.

CLIMATE

5. Cheraw has mild winters and hot summers. Temperatures drop below freezing on about 70 days during the year but rarely reach 0^{0}F. Temperatures reach 90^{0} on about 90 days during the year. The area receives about 47 inches of precipitation per year.

SOILS

6. The area surrounding Cheraw is hilly with an average elevation of 150 feet National Geodetic Vertical Datum (NGVD). It is dissected by small drainage basins such as Wilson Branch and Huckleberry Branch. Soils in Cheraw are of the Norfolk-Gilead-Rutledge association. The well drained Norfolk soils represent 40 percent of the association and are on the highest ridges. Surface layers are gray loamy sand, 18 to 30 inches thick. Gilead soils, comprising about 25 percent, are on the lower ridges and the gentler side slopes. They have light gray to gray loamy sand surface layers. Subsoils are brownish-yellow, compact sandy clay loam or sandy clay. The wet Rutledge soils, comprising about 20 percent, are in the oval-shaped upland depressons and along the poorly drained stream channels. Surface layers are black loamy sands, high in organic matter, and subsoils are gray loamy sands, usually saturated with water.

WATER QUALITY

7. Water quality has decreased in recent years partly as a result of rapid residential growth along the stream. The State of South Carolina has classified Wilson Branch as class B waters. Class B waters are described as waters suitable for domestic supply after complete treatment in accordance with requirements of the South Carolina State Board of Health. Class B waters are also suitable for propagation of fish, industrial and agricultural uses and other uses requiring water of lesser quality. The Town of Cheraw draws its water directly from the Pee Dee River. Although water treatment is required, the source is more than ample for the future.

NATURAL RESOURCES

8. Cheraw is a small town bordered by expansive farm lands. Wilson Branch is a tributary of Huckleberry Branch which is in turn a tributary of the Pee Dee River. Flooding in Wilson Branch stems either from direct runoff, Pee Dee River backwater, or a combination of both sources. A brief description of flora and fauna in the study area follows:

a. Flora. Vegetation occurring within the study area is typical of Southern Coastal Plain flora.

(1) Overstory species predominating include:

Sweet gum	Sugarberry	Water Oak
Black gum	Loblolly Pine	Willow Oak
Yellow Poplar	Longleaf Pine	

(2) Understory and ground cover species predominating include:

Dogwood	Poison Ivy	Plantains
Privet	Virginia Creeper	Potentillas
Honeysuckle	Rushes	

b. Wildlife. All wildlife species which occur in a typical residential, upper coastal plain stream bottom land habitat can be expected to occur in the Wilson Branch study area.

c. Fish. Wilson Branch is a shallow, narrow stream and does not support a significant fishery. The stream bottom consists of a silty-gravel base.

Threatened and Endangered Species

9. There is no critical habitat for any endangered or threatened species. Furthermore, there does not appear to be any potential for adversely affecting any endangered or threatened species.

PROBABLE IMPACT OF PROPOSED ACTION

10. The proposed Plan of Improvement, as described in preceding sections of this report, would provide approximately 1500 feet of nonstructural flood protection. This protection would reduce projected annual flood damage to the existing development on Wilson Branch.

Land Disruption

11. It is not envisioned that this project would induce changes in patterns of land use.

Noise

12. During the demolition or salvage phase there would be an increase in the ambient noise level, but it is anticipated that this increase will not be significant.

Water Quality

13. It is not expected that any significant impact on water quality would be realized as a result of this proposal. It is possible that some slight enhancement may be realized as five houses would be removed from the Wilson Branch drainage area.

14. Since the recommended plan does not involve the discharge of dredged or fill materials into the navigable waters of the United States or adjacent wetlands, the evaluations required under Section 404(b)(1) of the Clean Water Act were not necessary.

Air Quality

15. Any increase in air pollution would occur during the demolition or salvage of the houses as a result of exhaust fumes from equipment. The increase would be minor and temporary.

Historical and Archaeological Resources

16. There are no historical or archaeological resources in the immediate area of the proposed project. The project will not have any impacts on any property in or listed as eligible in the National Register of Historical Places.

Fisheries

17. No impact.

Wildlife

18. There would be no significant impact on area wildlife.

Socio-Economic

19. The major center of population, which affects the future growth of Wilson Branch Basin, is the Town of Cheraw in Chesterfield County. A large portion of the town lies within the basin limits.

20. Data for Chesterfield County is considered to be indicative of the basin area. The population of Chesterfield County has increased from 33,667 in 1970 to 38,161 in 1980.

21. Data on employed civilian workers by occupational groups are available from the 1970 Census of Population. The largest group of workers in Chesterfield County was in nonagricultural employment. Of this group 51.4 percent were in manufacturing-related employment. Wholesale and retail trade make up 12.5 percent of the group.

Endangered Species

22. This nonstrucutral flood control project would not jeopardize the continuing existence of any threatened or endangered species. There is no critical habitat within the area of project influence.

U. S. FISH AND WILDLIFE COORDINATION REPORT

23. Exhibit 3-1 presents a copy of the official U. S. Fish and Wildlife Coordination Report. Other pertinent correspondence from the U. S. Fish and Wildlife Service is contained in Section 2 of this appendix. The Service has indicated their support of the proposed plans.

FISH AND WILDLIFE COORDINATION ACT REPORT

WILSON BRANCH FLOOD CONTROL STUDY

CHERAW, SOUTH CAROLINA

U. S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

DIVISION OF ECOLOGICAL SERVICES
217 FORT JOHNSON ROAD
CHARLESTON, SOUTH CAROLINA 29412

APPENDIX 3
Exhibit 3-1

FISH AND WILDLIFE COORDINATION ACT REPORT

WILSON BRANCH FLOOD CONTROL STUDY

CHERAW, SOUTH CAROLINA

U.S. FISH AND WILDLIFE SERVICE
DIVISION OF ECOLOGICAL SERVICES
CHARLESTON, SOUTH CAROLINA

Prepared by:
James K. Kelly, Fish and Wildlife Biologist
Under the supervision of:
Roger L. Banks, Field Supervisor

June, 1982

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
PLATEAU BUILDING, ROOM A-5
50 SOUTH FRENCH BROAD AVENUE
ASHEVILLE, NORTH CAROLINA 28801

Lt. Colonel Bernard L. Stalmann
District Engineer
U.S. Army Corps of Engineers
P.O. Box 919
Charleston, South Carolina 29402

Dear Colonel Stalmann:

The following is our final Fish and Wildlife Coordination Act Report on Wilson Branch, Chesterfield County, Cheraw, South Carolina, study being conducted by the Charleston District Corps of Engineers. This study is authorized under Section 205 of the 1948 Flood Control Act, as amended, and is based on recommendations from findings of a reconnaissance study dated June 25, 1980. This report is submitted under authority of, and in accordance with, Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and should be forwarded to Division with the final Detailed Project Report. This report has been reviewed by the South Carolina Wildlife and Marine Resources Department(SCWMRD). The report and specifically the recommendations that follow have been endorsed by the SCWMRD as indicated in the letter dated November 30, 1981, from the Director, Dr. James A. Timmerman, Jr., of that Department, a copy of which is attached.

DESCRIPTION OF THE AREA

Wilson Branch is a small creek which lies within the Yadkin-Pee Dee River Basin, almost entirely within the corporate limits of Cheraw, South Carolina, in Chesterfield County (see Figure 1). Cheraw, with an approximate population of 6,000, is situated in the upper coastal plain division of the Atlantic Coastal Plain physiographic province. The surrounding area is hilly with an average elevation of 150 feet National Geodetic Vertical Datum (U.S. Army Corps of Engineers, 1980). Wilson Branch originates on the west side of town as an intermittent stream and flows in a generally northeast direction about two miles to its confluence with Huckleberry Branch, the latter forming the northern city limit boundary. Wilson Branch becomes a perennial stream before reaching the study area. Huckleberry Branch merges with the Pee Dee River at the eastern city limit boundary approximately 1 3/4 miles from the confluence

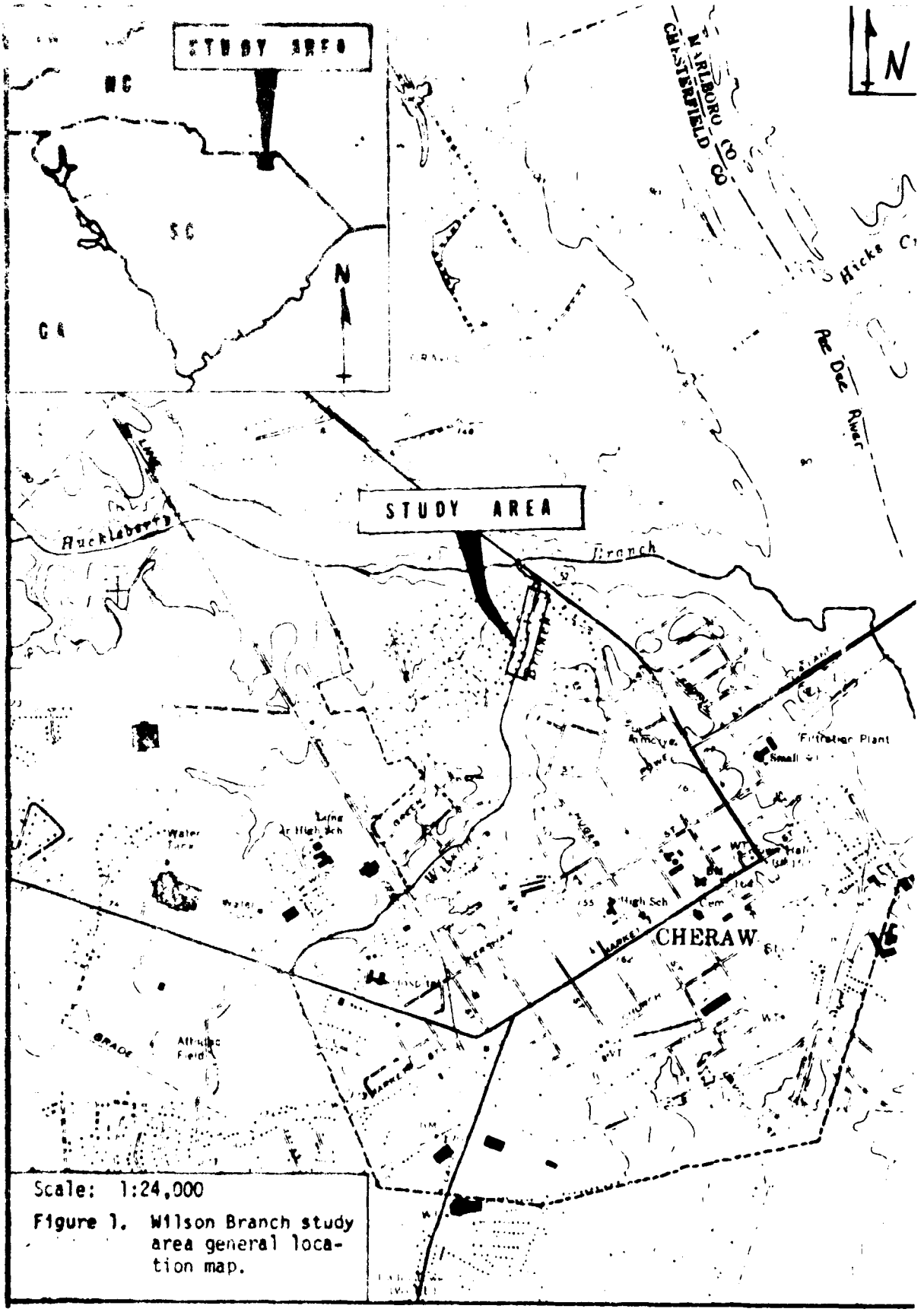

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Figure 1. Wilson Branch study area general location map.

or Wilson Branch and Huckleberry Branch. Under normal conditions Wilson Branch is narrow and shallow.

The South Carolina Department of Health and Environmental Control (SCDHEC) has classified Wilson Branch as Class B waters. Class B waters are fresh and suitable for secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with requirements of the South Carolina State Board of Health. Class B waters are suitable for fishing, survival and propagation of fish and other fauna and flora, and also for industrial and agricultural uses.

Study Area and Description of the Problem

The study area consists of a 1,500-foot stretch of Wilson Branch located between points 500 and 2,000 feet upstream from the confluence with Huckleberry Branch (see Figure 2). The section of Wilson Branch traversing the study area is approximately 3 to 6 feet wide and varies in depth from a few inches to a few feet. The area consists primarily of 10 single family residential houses with associated yards. Very little natural vegetation remains in the area. Vegetation generally consists of manicured lawns of introduced grasses and shrubs mowed to the edge of the creek. Some native tree species including sweet gum, yellow poplar, sugar berry, loblolly pine, and longleaf pine occur within the residential yards. Between the confluence with Huckleberry Branch and the closest house upstream in the study area, Wilson Branch is fringed with native vegetation. In addition to the previously mentioned tree species, overstory species in this area include red maple, water oak, willow oak, willows, hickories, American elm, and winged elm. Understory species include poison ivy, greenbriars, honeysuckle, and dogwood. Non-woody wetland vegetation in and along the creek includes smartweeds, plantains, and arrowheads.

Ten houses lie within the study reach. All of these houses are situated within 150 feet of Wilson Branch and are located along Huckleberry Drive, Park Drive and Sliding Hill Road. Five of these houses are 50 feet or less from Wilson Branch. Flooding from direct runoff and Pee Dee River backwater has been a past problem in the study area.

DESCRIPTION OF PROJECT PLAN

The Corps' reconnaissance report for Wilson Branch dated June 25, 1980, concluded that only the nonstructural solutions of relocation or evacuation are practical. For this and other reasons the report recommended that the most efficient approach would be to use the reconnaissance report along with supplemental study items as the decision document upon which authorization is made.

The decision, however, was made to go ahead with a Detailed Project Report (DPR). The draft DPR for Wilson Branch (May, 1982) describes only three

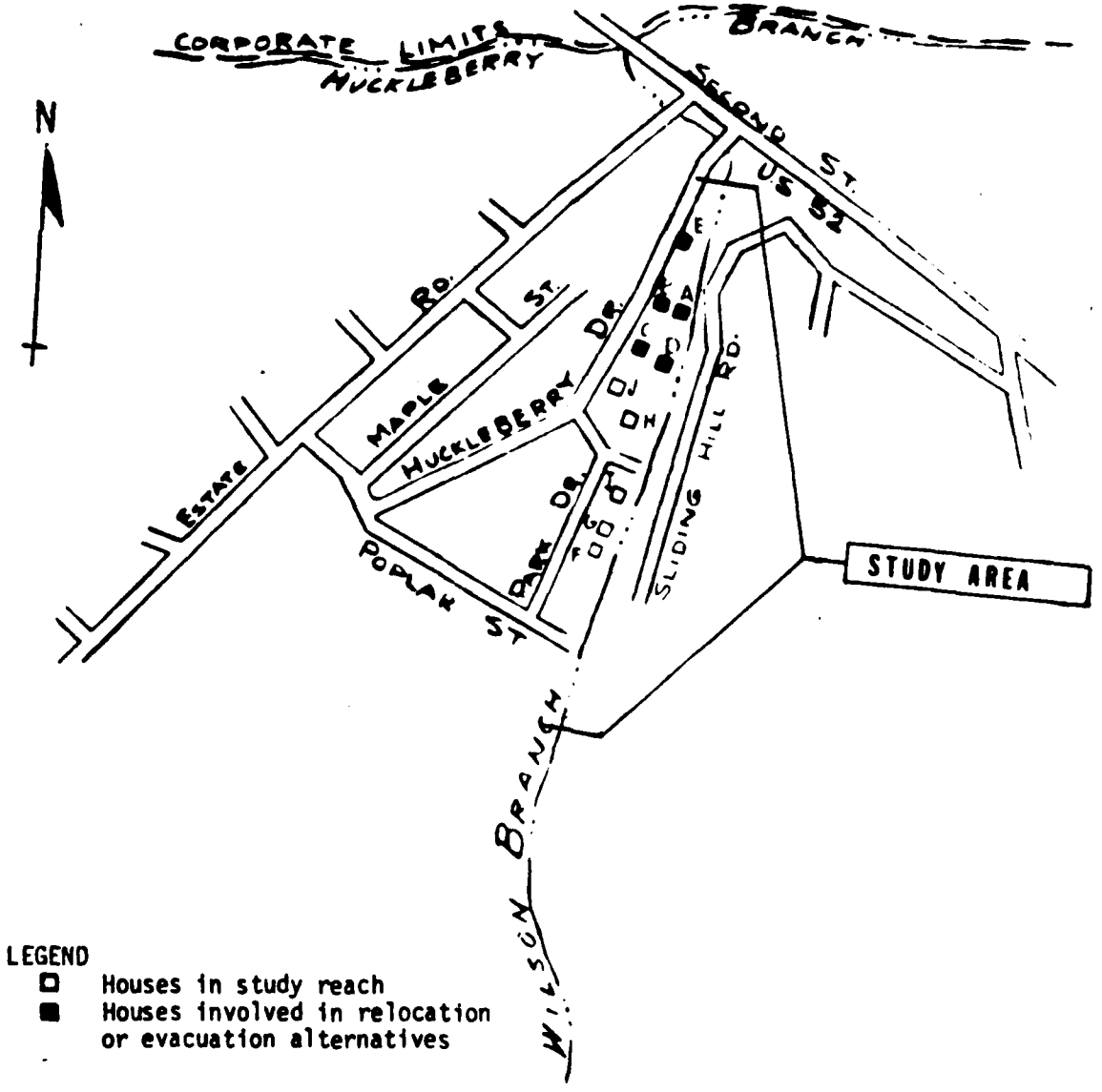

Figure 2. Location of houses within Wilson Branch study area.

alternatives which were carried into Stage 3. These alternatives consist of the following:

1. 10-year flood plain demolition plan.

2. 10-year flood plain relocation plan.

3. No action.

The demolition and relocation alternatives would involve five houses, all located in the ten-year flood plain. Driveways and foundation from these houses would be removed. As a result approximately 2,000 square feet per lot (10,000 square feet total) would have to be seeded. In addition, a private bridge and walkway which crosses Wilson Branch would be removed.

Stage 3 investigations showed the 10-year flood plain demolition plan to be the most feasible from both an economic and environmental standpoint. The demolition plan is the Corps' recommended plan.

The Corps has determined that structural solutions to the flooding problem are not implementable or feasible and only the nonstructural alternatives of demolition and relocation have been seriously considered. These alternatives would result in only limited disruption to the area. For this reason detailed fish and wildlife studies were not initiated. This report addresses only the nonstructural alternatives of demolition and relocation and does not satisfy the Fish and Wildlife Coordination Act requirements for any other alternatives.

EXISTING RESOURCES

Although detailed fish and wildlife studies are not warranted for this study, the fish and wildlife resources of the area can be discussed in a general manner based on the habitat types present.

The basic habitat types in the small study area include: a small area of partly ditched perennial, riverine type wetlands (Cowardin et al. 1979) classified as R3UB1Hd; residential lawns and associated deciduous and evergreen trees and shrubs; and small stands of mixed pine/hardwoods. More detailed species composition for these habitats has previously been described.

By providing valuable feeding, reproductive and cover habitat, riparian ecosystems, particularly in their natural state, are of high value for a wide diversity of game and fur-bearing species, as well as nongame species of mammals, birds, fish, reptiles and amphibians. In fact, according to Brinson et al (1981), riparian ecosystems support a greater diversity of wildlife than nearly all non-water-related habitats. Many wildlife species utilize riparian habitats in urban and residential areas to varying degrees; however, the diversity and abundance of fauna in areas such as the

study area is drastically reduced from those areas of optimum quality. The study area lies within but very close to the edge of the Cheraw corporate limits. Beyond the corporate limits exists higher quality, less disturbed habitat. This proximity to higher quality habitat will provide a greater faunal diversity and abundance in the study area than that found in other residential areas located more centrally in the city.

Fishery Resources

Due to the relatively small size of Wilson Branch in the study area, it is not anticipated that there is a large diversity or abundance of fish. However, in many cases adult fish use very small tributary streams for spawning and nursery areas in the spring when water levels are high. The study area can be expected to support a variety of invertebrates and small fish. A stream survey was conducted by the SCWMRD on July 12, 1979, in a 200-foot segment of Huckleberry Branch which averaged 14 feet wide and 1.3 feet deep. The survey turned up 26 species of fish including redfin pickerel, golden shiner, silvery minnow, redbreast sunfish, bluegill and sun check darter (personal communication, S.C. Wildlife and Marine Resources Department, August 1981). See Appendix A for a complete survey species list. It is expected that many of these species utilize portions of Wilson Branch, particularly during periods of high water.

Wildlife Resources

Although the study area is generally residential, a variety of birds, mammals and herptiles are expected to be found in the study area.

The town of Cheraw is bordered by habitat similar to that of Carolina Sandhills National Wildlife Refuge approximately 20 miles to the southwest. One hundred eighty-nine species of birds, 22 mammalian species and 66 herptiles have been identified on the refuge. Appendices B, C, and D provide a listing of these species. Although no wildlife surveys were conducted in the study area, many of these species have adapted to the presence of man and urban areas and would be able to utilize the habitats of the study area at varying times and numbers. Other species listed in the above mentioned appendices are easily disturbed by the presence of man and we would anticipate that these species would not utilize the habitats of the study area. However, most of these species could be found in varying numbers and at various times in nearby surrounding habitats.

Avian species have been particularly adaptive to urbanization and the influence of man. The most common species which could utilize the habitats of the study area include mourning dove, common flicker, Carolina chickadee, mockingbird, American robin and cardinal.

Several species of small mammals and herptiles could utilize the study area. Mammals of most probable common occurence include eastern gray

squirrel, raccoon, golden mouse, and eastern cottontail. Herptiles of likely occurrence include eastern mud turtle, green anole, eastern hognose snake and southern leopard frog.

Endangered Species

The endangered red-cockaded woodpecker is known to occur in areas close to Cheraw including Carolina Sandhills National Wildlife Refuge and Sandhill State Forest, both southwest of Cheraw. In addition, several plant species are under status review by the Service and may, at some future time, be listed. These species include Calamovilfa brevipilis var. brevipilis, Sporobolus teretifolius (dropseed), Pyxidanthera barbulate var. brevifolia (pyxie-moss), and Sarracenia rubra ssp. jonesii (sweet pitcher-plant). Although these plant species are not legally protected under the Endangered Species Act, your interest and efforts to avoid adverse impacts on them would be appreciated. In addition, the pine barrens treefrog, which is listed as endangered by the state of South Carolina, may occur in the study area.

The Charleston District Corps of Engineers has coordinated the Wilson Branch study with our endangered species staff in Asheville, North Carolina. According to the Corps Wilson Branch Environmental Assessment (1982), "There is no critical habitat for any endangered or threatened species. Furthermore, there does not appear to be any potential for adversely affecting any endangered or threatened species." The Service concurred by letter of June 14, 1982, with the Corps' finding of no affect on endangered or threatened species by the proposed non-structural flood control plan.

EVALUATION OF ALTERNATIVE PLANS

As previously discussed, the only alternatives under serious and practical consideration by the Corps for the Wilson Branch area are those of demolition or relocation. In either case, five houses and associated foundations and driveways would be removed along with a private bridge and walkway which crosses Wilson Branch. Demolition consists of the purchase and subsequent demolition or salvage of existing structures. Relocation consists of moving existing structures to a new location outside the flood plain. Either alternative would have the same environmental effects on the Wilson Branch area. Namely, approximately 2 acres of flood plain along Wilson Branch would be structure free. If properly planned and utilized future conditions of this land with the proposed project could provide a positive environmental benefit.

Future fish and wildlife resource conditions in the study area without the project would be expected to remain basically the same as existing conditions.

DISCUSSION

Wetlands of all classification are being destroyed at an alarming rate causing concern on a national basis. In general, these wetlands are extremely important to fish and wildlife resources. The FWS, like all Federal agencies, has been directed to take action to prevent the continued destruction of wetlands and to preserve, restore, and enhance the natural and beneficial values of the Nation's flood plains and wetlands (E.O. 11988 and 11990). Unless extensively drained and or filled, these areas are not suitable for structural development, but in their natural state these areas serve many important functions including essential habitat for fish and wildlife populations.

RECOMMENDATIONS

The Service recommends that after removal of the existing structures the area be converted to a permanently vegetated greenbelt. This would provide benefits in the form of erosion control, flood storage, protection of property, aesthetic beauty and increased fish and wildlife habitat.

By designating the greenbelt as a park or natural area the greatest benefit could be accrued to the fish and wildlife resources, with very low maintenance and upkeep. Natural areas of this type will increase not only the species diversity in the area but also the abundance of individual species. This recommendation would also result in the greatest public benefits, as local residents would be provided increased opportunities for nonconsumptive public use activities such as hiking trails, wildlife observation, and photography.

Areas disturbed by the removal of structures within the study area should be stabilized immediately in order to prevent erosion. This stabilization should be accomplished by the planting of locally adapted grasses of benefit to wildlife. Although natural succession would then eventually return the area to a climax forest community, the planting of native fleshy fruit and mast producing shrubs and trees would add diversity and abundance of wildlife food supply and cover to the area. When a diversity of fleshy fruit and mast producing plants are present, the habitat will meet the needs of many wildlife species year after year. The Service, Soil Conservation Service (SCS), or SCWMRD biologists could aid in the planning of wildlife plantings.

Finally, in order to protect the area as a permanent greenbelt and prevent future development, the Service recommends that the Corps obtain the necessary legal assurances from the city of Cheraw.

CONCLUSION

Best use of flood plains and wetlands is use which does not destroy or

severely reduce the natural, beneficial values of these areas. We believe that the alternatives of demolition and relocation, if properly planned and implemented, could result in a net environmental gain with enhanced habitat for fish and wildlife resources and public use of those resources.

As earlier stated, our comments in this report address only the nonstructural alternatives of demolition and relocation. This report does not satisfy the Fish and Wildlife Coordination Act requirements for any other alternatives.

The Service appreciates the opportunity to provide comments on the Wilson Branch, Chesterfield County, study.

Sincerely yours,

William C. Hickling
Area Manager

South Carolina
Wildlife & Marine
Resources Department

James A. Timmerman, Jr., Ph.D.
Executive Director

November 30, 1981

Mr. William C. Hickling
Area Manager
Fish & Wildlife Service
Plateau Building, Room A-5
50 S. French Broad Avenue
Asheville, N. C. 28801

Re: Draft Report - Wilson Branch, Chesterfield County, S. C.

Dear Mr. Hickling:

Personnel of the South Carolina Wildlife and Marine Resources Department have reviewed the draft Fish and Wildlife Coordination Act Report for Wilson Branch, Chesterfield County. The only alternative being considered is the relocation and evacuation of flood damaged structures and should not have any adverse impacts on fish and wildlife.

Therefore, we concur in the findings and recommendations included in the report.

Sincerely,

James A. Timmerman, Jr.
Executive Director

JATjr/sa
cc: Mr. Roger Banks

Rembert C. Dennis Building ■ P.O. Box 167 ■ Columbia, South Carolina 29202 ■ Telephone: 803-758-0020

LITERATURE CITED

Brinson, M. M., B. L. Swift, R. C. Plantico, and J. S. Barclay. 1981. Riparian Ecosystems: Their Ecology and Status. USDI, Fish and Wildlife Service. 155 pp.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. USDI, Fish and Wildlife Service. 103 pp.

U.S. Army Corps of Engineers. 1980. Reconnaissance report, Wilson Branch, Carolina. Charleston, S.C. 15 pp., letter and appendix.

U.S. Army Corps of Engineers. 1982. Draft Detailed Project Report for Wilson Branch, Chester County, S.C. 49 pp., plates and appendices.

APPENDICES

APPENDIX A

List of fish sampled by rotenone on Huckleberry Branch, July 12, 1979.[1]

American eel	Anguilla rostrata
Redfin pickerel	Esox americanus americanus
Silvery minnow	Hybognathus nuchalis
Creek chub	Semotilus atromaculatus
Creek chubsucker	Erimyzon oblongus
Golden shiner	Notemigonus crysoleucas
Spottail shiner	Notropis hudsonius
Snail bullhead	Ictalurus brunneus
Yellow bullhead	Ictalurus natalis
Brown bullhead	Ictalurus nebulosus
Pirate perch	Aphredoderus sayanus
Mosquitofish	Gambusia affinis
Sawcheek darter	Etheostoma serriferum
Tessellated darter	Etheostoma olmstedi
Yellow perch	Perca flavescens
Mud sunfish	Acantharchus pomotis
Flier	Centrarchus macropterus
Bluespotted sunfish	Enneacanthus gbriosus
Banded sunfish	Enneacanthus obesus
Redbreasted sunfish	Lepomis auritus
Green sunfish	Lepomis cyanellus
Pumpkinseed	Lepomis gibbosus
Warmouth	Lepomis gulosus
Bluegill	Lepomis macrochirus
Dollar sunfish	Lepomis marginatus
Largemouth bass	Micropterus salmoides

1. Data provided by South Carolina Wildlife and Marine Resources Department.

APPENDIX B

Birds of Carolina Sandhills National Wildlife Refuge.

Common loon
Horned grebe
Pied-billed grebe
Double-crested cormorant
Great blue heron
Green heron
Little blue heron
Great egret
Snowy egret
Cattle egret
Black-crowned night heron
Least bittern
American bittern
White ibis
Canada goose
Snow goose
White-fronted goose
Mallard
Black duck
Gadwall
Pintail
Green-winged teal
Blue-winged teal
American wigeon
Northern shoveler
Wood duck
Redhead
Ring-necked duck
Canvasback
Lesser scaup
Common goldeneye
Bufflehead
Ruddy duck
Hooded merganser
Turkey vulture
Black vulture
Sharp-shinned hawk
Cooper's hawk
Red-tailed hawk
Red-shouldered hawk
Broad-winged hawk
Golden eagle
Bald eagle
Marsh hawk
Osprey
American kestrel
Bobwhite
Turkey

King rail
Virginia rail
American coot
Killdeer
American woodcock
Common snipe
Upland sandpiper
Spotted sandpiper
Solitary sandpiper
Greater yellowlegs
Lesser yellowlegs
Pectoral sandpiper
Least sandpiper
Herring gull
Ring-billed gull
Mourning dove
Ground dove
Yellow-billed cuckoo
Black-billed cuckoo
Barn owl
Screech owl
Great horned owl
Barred owl
Long-eared owl
Short-eared owl
Whip-poor will
Chuck-will's widow
Common nighthawk
Chimney swift
Ruby-throated hummingbird
Belted kingfisher
Common flicker
Pileated woodpecker
Red-bellied woodpecker
Red-cockaded woodpecker
Red-headed woodpecker
Yellow-bellied sapsucker
Hairy woodpecker
Downey woodpecker
Eastern kingbird
Great crested flycatcher
Eastern phoebe
Acadian flycatcher
Eastern wood pewee
Tree swallow
Rough-winged swallow
Barn swallow
Purple martin

Blue jay
Common crow
Fish crow
Carolina chickadee
Tufted titmouse
White-breasted nuthatch
Red-breasted nuthatch
Brown-headed nuthatch
Brown creeper
House wren
Winter wren
Carolina wren
Long-billed marsh wren
Short-billed marsh wren
Mockingbird
Catbird
Brown thrasher
American robin
Wood thrush
Hermit thrush
Swainson's thrush
Gray-cheeked thrush
Veery
Eastern bluebird
Blue-gray gnatcatcher
Golden-crowned kinglet
Rub-crowned kinglet
Water pipit
Cedar waxwing
Loggerhead shrike
Starling
White-eyed vireo
Yellow-throated vireo
Solitary vireo
Red-eyed vireo
Black-and-white warbler
Prothonotary warbler
Swainson's warbler
Blue-winged warbler
Golden-winged warbler
Tennessee warbler
Orange-crowned warbler
Northern parula
Yellow warbler
Magnolia warbler
Cape May warbler
Black-throated blue warbler
Yellow-rumped warbler
Black-throated green warbler
Blackburnian warbler
Yellow-throated warbler
Blackpoll warbler
Pine warbler
Prairie warbler
Palm warbler
Ovenbird
Northern waterthrush
Louisiana waterthrush
Kentucky warbler
Common yellowthroat
Yellow-breasted chat
Hooded warbler
Canada warbler
American redstart
House sparrow
Bobolink
Eastern meadowlark
Red-winged blackbird
Orchard oriole
Northen oriole
Rusty blackbird
Common grackle
Brown-headed cowbird
Scarlet tanager
Summer tanager
Cardinal
Evening grosbeak
Blue grosbeak
Indigo bunting
Purple finch
Pine siskin
American goldfinch
Rufous-sided towhee
Savannah sparrow
Vesper sparrow
Bachman's sparrow
Dark-eyed junco
Chipping sparrow
Field sparrow
White-throated sparrow
Fox sparrow
Swamp sparrow
Song sparrow

APPENDIX C

Mammals of Carolina Sandhills National Wildlife Refuge

Opossum	*Didelphis marsupialis*
Eastern Mole	*Scalopus aquaticus*
Red Bat	*Lasiurus borealis*
Black Bear	*Ursus americanus*
Raccoon	*Procyon lotor*
Mink	*Mustela vison*
River Otter	*Lontra canadensis*
Striped Skunk	*Mephitis mephitis*
Red Fox	*Vulpes fulva*
Gray Fox	*Urocyon cinereoargenteus*
Bobcat	*Lynx rufus*
Eastern Cougar	*Felis concolor*
Eastern Gray Squirrel	*Sciurus carolinensis*
Eastern Fox Squirrel (Southern Phase)	*Sciurus niger*
Southern Flying Squirrel	*Glaucomys volans*
Beaver	*Castor canadensis*
Muskrat	*Ondatra zibethica*
Golden Mouse	*Ochrotomys nuttallii*
Eastern Woodrat	*Neotoma floridana*
Cotton Rat	*Sigmodon hispidus*
Eastern Cottontail	*Sylvilagus floridanus*
White-tailed Deer	*Odocoileus virginianus*

The following list includes species whose range indicates they should be present, but which have not been collected or observed. Some of them may actually be quite common.

Southeastern Shrew	*Sorex longirostris*
Least Shrew	*Cryptotis parva*
Shorttail Shrew	*Blarina brevicauda*
Little Brown Bat	*Myotis lucifugus*
Silver-haired Bat	*Lasionycteris noctivagans*
Big Brown Bat	*Eptesicus fuscus*
Hoary Bat	*Lasiurus cinereus*
Seminole Bat	*Lasiurus seminolus*
Eastern Yellow-bat	*Lasiurus intermedius*
Eastern Big-eared Bat	*Plecotus rafinesquei*
Long-tailed Weasel	*Mustela frenata*
Spotted Skunk	*Spilogale putorius*
Eastern Harvest Mouse	*Reithrodontomys humulis*
White-footed Mouse	*Peromyscus leucopus*
Cotton Mouse	*Peromyscus gossypinus*
Rice Rat	*Oryzomys palustris*
Meadow Vole	*Microtus pennsylvanicus*
Pine Vole	*Pitimys pinetorum*
Jumping Mouse	*Zapus hudsonius*
Marsh Rabbit	*Sylvilagus palustris*

Herptiles of Carolina Sandhills National Wildlife Refuge

REPTILES

Turtles

Common Snapping Turtle	*Chelydra serpentina serpentina*
Stinkpot	*Sternotherus odoratus*
Eastern Mud Turtle	*Kinosternon subrubrum subrubrum*
Spotted Turtle	*Clemmys guttata*
Eastern Box Turtle	*Terrapene carolina carolina*
Eastern Painted Turtle	*Chrysemys picta picta*
Yellow-bellied Turtle	*Chrysemys scripta scripta*
River Cooter	*Chrysemys concinna concinna*

Lizards

Green Anole	*Anolis carolinensis carolinensis*
Northern Fence Lizard	*Sceloporus undulatus*
Six-lined Racerunner	*Cnemidophorus sexlineatus*
Ground Skink	*Leiolopisma laterale*
Broad-headed Skink	*Eumeces laticeps*
Southeastern Five-lined Skink	*Eumeces inexpectatus*
Eastern Glass Lizard	*Ophisaurus ventralis*

Snakes

Brown Water Snake	*Natrix taxispilota*
Red-bellied Water Snake	*Natrix erythrogaster erythrogaster*
Midland Water Snake	*Natrix sipedon pleuralis*
Banded Water Snake	*Natrix fasciata fasciata*
Carolina Swamp Snake	*Seminatrix pygaea paludis*
Brown Snake	*Storeria dekayi*
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Rough Earth Snake	*Virginia striatula*
Eastern Hognose Snake	*Heterodon platyrhinos*
Southern Hognose Snake	*Heterodon simus*
Mud Snake	*Farancia abacura*
Northern Black Racer	*Coluber constrictor constrictor*
Eastern Coachwhip	*Masticophis flagellum flagellum*
Rough Green Snake	*Opheodrys aestivus*
Corn Snake	*Elaphe guttata guttata*
Black Rat Snake	*Elaphe obsoleta obsoleta*
Northern Pine Snake	*Pituophis melanoleucus melanoleucus*
Eastern Kingsnake	*Lampropeltis getulus getulus*

Snakes (Cont'd.)

Mole Snake	Lampropeltis calligaster rhombomaculata
Scarlet Snake	Cemophora coccinea
Southeastern Crowned Snake	Tantilla coronata
Copperhead	Agkistrodon contortrix
Eastern Cottonmouth	Agkistrodon piscivorus piscivorus
Carolina Pigmy Rattlesnake	Sistrurus miliarius miliarius
Canebrake Rattlesnake	Crotalus horridus atricaudatus

AMPHIBIANS

Salamanders

Dwarf Waterdog	Necturus punctatus
Eastern Lesser Siren	Siren intermedia intermedia
Two-toed Amphiuma	Amphiuma means
Red-spotted Newt; Broken-striped Newt	Notophthalamus viridescens
Dusky Salamander	Desmognathus fuscus
Slimy Salamander	Plethodon glutinosus glutinosus
Eastern Mud Salamander	Pseudotriton montanus montanus
Southern Two-lined Salamander	Eurycea bislineata cirrigera

Frogs and Toads

Eastern Spadefoot	Scaphiopus holbrooki holbrooki
Southern Toad	Bufo terrestris
Fowler's Toad	Bufo woodhousei fowleri
Oak Toad	Bufo quercicus
Southern Cricket Frog	Acris gryllus gryllus
Northern Spring Peeper	Hyla crucifer crucifer
Green Treefrog	Hyla cinerea
Pine Barrnes Treefrog	Hyla andersonii
Pine Woods Treefrog	Hyla femoralis
Squirrel Treefrog	Hyla squirrela
Gray Treefrog	Hyla versicolor or Hyla chrysoscelis
Barking Treefrog	Hyla gratiosa
Ornate Chorus Frog	Pseudacris ornata
Eastern Narrow-mouthed Toad	Gastrophryne carolinensis
Bullfrog	Rana catesbeiana
Carpenter Frog	Rana virgatipes
Green Frog	Rana clamitans
Southern Leopard Frog	Rana utricularia

SECTION 2

COORDINATION

(PERTINENT CORRESPONDENCE)

The Town of Cheraw

May 21, 1982

Mr. Bernard E. Stalmann
LTS, Corps of Engineers
District Engineer
Department of the Army
Charleston District
P.O. Box 919
Charleston, S.C. 29402

Dear Col. Stalmann:

Re: Wilson Branch Flood Control Project
Cheraw, S.C.

The Mayor and Council of the Town of Cheraw have carefully reviewed the recommendations for flood control measures along the Wilson Branch area outlined in the Corps' Detailed Project Report dated May 1982. The Council agrees with the Corps' recommendation of structural demolition in an effort to alleviate the flooding of the affected households in this area.

The Town understands the requirements for sponsorship of this project specified in items A-F on page 49 of the above mentioned Project Report and is willing to act as local project sponsor accepting your recommendations as proposed.

In addition to the recommendations made in this report, the Town Council has proposed an additional requirement of having the property owners directly involved in the project reimburse the Town fifty percent (50%) of the local share before committing fully to participation as sponsor of the project. At a meeting with these local property-owners on May 20, 1982 the owners enthusiastically agreed to this proposal by Council and the Town is hereby making known its intent to sponsor the project with this noted additional requirement. The residents of this area are anxious to cooperate in the completion of this project and await the Corps' final approval.

We look forward to working with your office on this project.

Sincerely,

Howard E. Duvall, Jr.
Mayor

Phone (803) 537-7283 P. O. Box 111 Cheraw, S. C. 29520

SACEN-PS

21 May 1982
Harris/235/mm

MEMORANDUM FOR RECORD

SUBJECT: Wilson Branch, Cheraw, SC

In compliance with instructions contained in DR 335-1-1, report of field visit by Messrs David Harris and Edwin Meredith is made as follows:

a. Date of visit: 20 May 1982

b. Place: Cheraw, SC, City Hall

c. Purpose: Corps representatives met with City Council at 1730 hours to discuss potential sources of local funding for the non-structural proposals on Wilson Branch. This meeting was followed by a second meeting held at 1900 hours during which the affected local people were informed of the study results and of the city's proposal to require individual contribution towards the project first cost. Local affected individuals were requested to indicate whether or not they supported the Corps' and the City's proposals.

d. Attendees:

1730 Meeting

Howard E. Duvall, Jr., Mayor, City of Cheraw
Bill Taylor, City Administrator
Members, Cheraw City Council
Edwin Meredith, CoE, Chasn
David Harris, CoE, Chasn
Jim Thorton, CoE, Sav

1900 Meeting

All of the above, plus:
Mrs. Charles Kundra, Propertyowner, 105 Huckleberry Drive
Mr. & Mrs. T. H. Douglas, Propertyowner, 105 Park Drive
Mr. & Mrs. G. L. Crawford, Propertyowner, 103 Huckleberry Drive
Ms. Alma S. Player, Propertyowner, 310 Sliding Hill Rd.
L. R. Redfern, Jr., Propertyowner, 312 Sliding Hill Rd.
Mr. & Mrs. John Gardiner, Propertyowner, 314 Sliding Hill Rd.

e. Specific matters considered: Local participation in providing non-Federal share of project cost and the acceptability of proposed plan of improvement by local government and affected individuals.

SACEN-PS 21 May 1982
SUBJECT: Wilson Branch, Cheraw, SC

f. Summary:

(1) 1730 Meeting - City officials provided a light evening meal for Corps representatives and council members, prior to meeting for the purpose of discussing means of providing local funds necessary for project implementation. Proposals for flood control on Wilson Branch had been previously discussed with local officials at a meeting held on 29 April 1982. The proposals consist of the removal of five flood prone structures from the flood plain.

Following the meal, Corps representatives briefly summarized the flood control proposals and the associated requirements for compliance with the provisions of PL 91-646 (Real Property Acquisition Policies Act of 1970). It was noted that local government must provide 20% of the project cost (including cost required by compliance with PL 91-646). The City could provide "in kind" services to offset their cost.

Mayor Duvall indicated that Council supported the plan for removing five (5) flood prone structures from the flood plain and was willing to contribute 10% of the project cost, provided that affected individuals would also contribute 10% and thus provide the 20% local share of project cost.

Mr. Thornton indicated there may be some legal questions concerning this proposal. It was decided, however, that this plan would be presented to local propertyowners and that if it was acceptable to them, then the City would submit a Letter of Intent for local sponsorship which would outline their cost-sharing proposal and would serve as a document for a policy decision.

(2) 1900 Meeting - Following the above meeting with the City Council, a second meeting was held to present the flood control proposals to the affected propertyowners. The City of Cheraw reported they had handcarried an invitation to each of the 11 residences within the study area. Four of five propertyowners whose residence was being considered for demolition were in attendance. (The fifth structure was vacant and its owners had moved from town).

Mr. David Harris was asked by Mayor Duvall to discuss the study process and the results of flood control investigations. Mr. Harris explained the flood control program (Section 205 of the 1948 Flood Control Act, as amended), and discussed the economic, environmental and technical analyses which had been conducted. The results of the study indicated that the best plan of improvement for flood control would involve removal of five structures. This plan had an estimated first cost of $368,870 (including relocation cost). Average annual project benefits when compared to annual project cost resulted in a benefit-to-cost ratio of 1.11 to 1. It was noted that persons displaced by plan implementation would be entitled to relocation benefits to be discussed later in the meeting. Mr. Harris also stated that the plan would be limited to the five designated structures due to economic restraints. Following this discussion, those attending were provided an opportunity to ask questions.

Mr. Jim Thorton, the Corps representative from Savannah District Acquisition Branch, discussed relocation assistance available to displaced persons as provided by PL 91-646. A brochure (EP 405-1-1) was given to each affected individual for further study.

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SUBJECT: Wilson Branch, Cheraw, SC

Mayor Duvall then presented Council's proposal to share the required local cost with affected propertyowners. He stated that the City would provide half of the local share if propertyowners agreed to provide half. He also noted that the City's contribution would be contigent upon Corps' approval of the proposal.

Following a brief discussion period, affected propertyowners were polled to determine if they supported the flood control proposals, including their contribution to project first cost. All in attendance indicated strong support of the plans presented.

Subject meeting adjourned at approximately 2100 hours.

g. Commitments made: The Corps agreed to pursue completion of the Detailed Project Report in an effort to obtain construction start funds in FY 82. Local representatives agreed to submit a Letter of Intent for project sponsorship.

David C Harris

DAVID C. HARRIS
Planning and Reports Branch

SACEN-PS

3 May 1982
Harris/235/nm

MEMORANDUM FOR RECORD

SUBJECT: Wilson Branch, Cheraw, SC

In compliance with instructions contained in DR 335-1-1, report of field visit by Messrs David Harris and Edwin Meredith is made as follows:

a. Date of visit: 29 April 1982, 1730 hours

b. Place: Cheraw, SC, City Hall

c. Purpose: Corps representative met with City Council to discuss findings of the Wilson Branch flood control study and to inform local government of the necessary local responsibilities should a flood control project be implemented.

d. Attendees: Howard E. Duvall, Jr., Mayor, City of Cheraw
Bill Taylor, City Administrator
Members, Cheraw City Council

e. Specific matters considered: A draft DPR has been prepared for flood control on Wilson Branch, recommending the evacuation of five (5) residential structures. Copies of this draft report were presented for local review along with property appraisals prepared during feasibility studies and information brochures discussing the rights of affected propertyowners (reference PL 91-646). Subject meeting was held to discuss these documents and to determine the local desirability of further coordination with affected propertyowners.

f. Summary: Corps' representatives discussed the above-referenced documents with local representatives and informed them of the local commitment necessary to implement a non-structural flood control project. Local representatives were informed of the required 20% contribution towards project cost and of the pending requirement that local government provide this "up front" money for project implementation and then receive reimbursement of 80% of these funds. It was noted, however, that this procedure could be followed on a progressive payment scheme during which the City could receive reimbursement following the purchase of each individual structure and thus never commit more than the amount of funds required for evacuation of the most expensive flood plain structure.

Local representatives discussed sources of revenue for the 20% local contribution. Potential sources discussed included "in-kind" work by the City (i.e. restoration of flood plain property, demolition of structures, etc.) and a scheme to obtain a portion or all of the 20% local share as a contribution from individual propertyowners. (It was noted that local officials had proposed a similar scheme for recouping local cost for a non-structural project recommended by Mobile District in Brewton and East Brewton, Alabama).

SACEN-PS 3 May 1982
SUBJECT: Wilson Branch, Cheraw, SC

City officials indicated a definite interest in the proposed project and requested that a second meeting be scheduled as early as possible to discuss proposals with affected propertyowners. It was proposed that a date for this meeting be established for the month of May and that representatives from SASRE (real estate personnel) be in attendance.

g. Commitments made: City officials will review the findings of subject study and will coordinate a second meeting between the Corps, City officials, and propertyowners. A suitable date for this meeting will be established as early as possible.

David C Harris

DAVID HARRIS

APPENDIX 3
3-12

United States Department of the Interior
FISH AND WILDLIFE SERVICE
PLATEAU BUILDING, ROOM A-5
50 SOUTH FRENCH BROAD AVENUE
ASHEVILLE, NORTH CAROLINA 28801

September 29, 1981

Mr. Jack J. Lesemann
Chief, Engineering Division
Department of the Army
Charleston District, COE
P.O. Box 919
Charleston, SC 29402

Re: 4-2-81-276

Dear Mr. Lesemann:

We have reviewed the proposed flood control measures on Wilson Branch near Cheraw in Chesterfield County, South Carolina, as requested by letter of September 21, 1981, received September 23, 1981. It appears that the endangered red-cockaded woodpecker (Picoides borealis) may occur in the area of influence of this action. Our records indicate that no other threatened or endangered species or species proposed for listing are known to occur within the project area.

In addition to this listed species, there are several plant species which, although not now listed or officially proposed for listing as endangered or threatened, are under status review by the Service and may be listed at some time in the future. These species are not legally protected under the Endangered Species Act and the biological assessment requirements do not apply to them. However, we would appreciate any efforts you might make to avoid adversely impacting them. Those species under status review which may occur within the project area are:

1. Calamovilfa brevipilis var. brevipilis
2. Sporobolus teretifolius
3. Pyxidanthera barbulata var. brevifolia
4. Sarracenia rubra ssp. jonesii

Section 7(c) of the Endangered Species Act of 1973, as amended 1978, requires agencies to provide a biological assessment for the listed species and/or the species proposed for listing which are likely to be affected. The biological assessment shall be completed within 180 days after the date on which initiated, or a mutually agreed time frame, before any contracts for construction are entered into, and before construction is begun. We do not feel that we can adequately assess the effects of the proposed action on listed species, species proposed for listing or Critical Habitat without a complete assessment. At a minimum the following information is requested:

1. Identification of the listed species, species proposed for listing and Critical Habitat determined to be present within the area affected by the proposal.

2. Description of the survey methods used to determine presence of listed species or species proposed for listing within the area.

3. The results of a comprehensive survey of the area.

4. Description of any difficulties encountered in obtaining data and completing proposed studies.

5. Description of the proposed construction project and associated activities.

6. Description of methods and results of studies made to determine the actual and potential impacts of project or associated activities on listed species, species proposed for listing, or Critical Habitat. In addition to the direct (site related) impacts of project construction the biological assessments should include, when applicable, descriptions of:

   A. Impacts associated with project operation.

   B. Secondary impacts from activities, such as development, which will be generated by the proposed project.

   C. The cumulative effects of the proposal on the species and/or its Critical Habitat. Cumulative effects are defined as the direct and indirect impacts of the Federal action under consideration coupled with the identifiable effects of other reasonably foreseeable actions of the Federal agency; other Federal, State, and local agencies; corporations; and individuals upon a species or its Critical Habitat.

7. Where impacts to listed species, species proposed for listing, or Critical Habitat are identified, the assessment should include a discussion of the efforts that will be taken to eliminate, reduce, or mitigate any adverse effects.

8. Conclusions of the agency including recommendations regarding further studies.

9. Any other relevant information.

Should you require additional information on this subject, please contact Mr. Gary Henry, Mr. Robert Currie, or Ms. Nora Murdock in the Asheville Area Office, FTS 672-0321, commercial 704/258-2850, ext. 321.

After your agency has completed and reviewed the assessment, it is your responsibility to determine if the proposed action "may affect" any of the listed species or Critical Habitat. If the determination is "may affect," you are required to initiate consultation by a written request to this office. At this time you should provide a copy of the biological

assessment and any other relevant information that assisted you in reaching your conclusion. If the determination is "no effect," consultation is not necessary, unless requested by the Fish and Wildlife Service.

If the species proposed for listing have not been listed in the period of time during which a biological assessment was conducted, consultation is not required. However, at any point in time that the species is listed, you are required to reinitiate consultation, if you determined that the proposed action "may affect" the species. However, if the action is likely to jeopardize the continued existence of proposed species or result in the destruction or adverse modification of proposed Critical Habitat, you are required to confer with this office for assistance in identifying and resolving potential conflicts at an early stage in the planning process.

Your attention is also directed to Section 7(d) of the Endangered Species Act, as amended, which underscores the requirement that the Federal agency and the permit or license applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which in effect would deny the formulation or implementation of reasonable alternatives regarding their actions on any Endangered or Threatened species.

If we can be of further assistance, please advise.

Sincerely yours,

William C. Hickling

William C. Hickling
Area Manager

South Carolina Department of Archives and History
1430 Senate Street
Columbia, S. C.

P.O. Box 11,669
Capitol Station 29211
803 – 758-5816

November 27, 1981

Lt. Col. Bernard E. Stalmann
District Engineer
Corps of Engineers
Department of the Army
Charleston District
Corps of Engineers
Post Office Box 919
Charleston, S.C. 29402

Re: Wilson Branch Study -- Assessment of Affected Structures, Chesterfield County, South Carolina

Dear Lt. Col. Stalmann:

Thank you for your letter of November 20, 1981, regarding your request for official State Historic Preservation Officer comment in accordance with the National Historic Preservation Act of 1966, as amended, on the eligibility for inclusion in the National Register of Historic Places for any sites in the Wilson Branch Study Area, Chesterfield County.

In the immediate study area and vicinity, there are no sites included on the National Register or eligible for inclusion. The structures to be demolished do not, in our opinion, meet the criteria for inclusion in the Register. We ourselves know of no such sites, and in our judgment the probability of affecting archeological sites of significance is too minimal to warrant a survey.

The Federal procedures for the protection of historic properties (36CFR800) require that the Federal agency official in charge of a federally funded or licensed project consult with the appropriate State Historic Preservation Officer. The procedures do not relieve the Federal agency official of the final responsibility for reaching an opinion of his own as to whether or not historic values have been adequately taken into account in allowing the project to proceed. The opinion of the State Historic Preservation Officer is not definitive, either by law or by established Federal procedure. In reaching a conclusion of his own, the Federal agency official may well wish to consult other experts.

Sincerely,

Charles E. Lee
State Historic Preservation Officer

CEL/dkn
cc: Mr. Pete Rogers, Historic Preservation Planner
Pee Dee Regional Council of Governments

APPENDIX 3
3-16

The Town of Cheraw

Cheraw, S. C. 29520

November 12, 1980

Bernard E. Stalmann
LTC, Corps of Engineers
District Engineer
Department of the Army
Charleston District, Corps of Engineers
P. O. Box 919
Charleston, South Carolina 29402

Dear Col. Stalmann:

The Mayor and Council of the Town of Cheraw has carefully studied the findings of your preliminary reconnaissance of the flooding on Wilson Branch in Cheraw. We concur that a nonstructural type of flood control measure is the only feasible solution to this problem. The Town of Cheraw is both financially and legally able to participate with the Corps of Engineers in this project.

At our meeting with your representative, Mr. David Harris, it was explained that in the next phase of this study the town would have more input as to the extent of the project and the amount of compensation to the property owners. We also understand that the decision of further participation by the town could be made after the corps has submitted its final recommendations.

We look forward to working with your office on this project.

Very truly yours,

Howard E. Duvall, Jr.

Howard E. Duvall, Jr.
Mayor

ml

SACEN-PS 22 October 1980

MEMORANDUM FOR RECORD

SUBJECT: Wilson Branch, Cheraw, South Carolina

In compliance with instructions contained in District Regulation No. 355-1-1, dated 14 June 1977, report of field visit by Mr. David Harris is made as follows:

a. Date of Visit: 16 October 1980, 1730 hours

b. Place: Cheraw, South Carolina, Town Hall

c. Purpose of Visit: The undersigned met with local representatives at their request to discuss the findings of reconnaissance investigations on Wilson Branch and to discuss local commitments requested by SAD for continuation of flood control investigations.

d. Persons Contacted:

Howard E. Duvall, Jr., Mayor - Town of Cheraw
R.R. Sipe - City Administrator
C. Charles Cole - Councilman
Richard L. Young - Councilman
C. H. McBride - Councilman
Andrew R. Ingram - Councilman
Richard L. Young - Councilman
Ted Morris - Local Citizen

e. Specific Matters Considered: A reconnaissance report for flood control was prepared and submitted to SAD recommending relocation of five flood plain structures, SAD appeared hesitant in approving subject report and thus gave conditional approval subject to receipt of a letter from the town of Cheraw stating their legal and financial ability to participate in this type of flood control measure. These requirements and report findings were the subject of this meeting.

f. Summary: Subject meeting started at 1730 hours with Mayor Duvall introducing the undersigned and requesting a brief summary of the findings of flood control investigations on Wilson Branch. The undersigned responded with a summary of the Section 205 program and the recommendations of reconnaissance investigations which recommended relocation of five flood plain houses. It was noted that policy problems could arise in the implementation of this type of alternative in that use of Federal funds for relocation purposes had been

questioned. Implementation of the project, if authorized, would probably result in the purchase of affected flood plain properties and the resale of flood plain structures to individuals for salvage values.

Local representatives express concern over the excessive cost of relocation presented in the reconnaissance report and noted that flood conditions could worsen in the branch and thus affect other properties not included in the five recommended for relocation.

It was noted that reconnaissance estimates appeared on the high side and that actual cost would probably be lower and that detailed studies would include an investigation of future conditions to determine the feasibility of adding additional structures to those recommended for evacuation.

Local representatives also questioned the financial obligation of the town should detailed study be authorized. They were informed that the Federal government would pay all cost for feasibility investigations and that local cost would consist of twenty percent of the actual cost of project construction. Obligation of local funds would not be required before a project was authorized.

Local representatives indicated their support and financial and legal capability for nonstructural solutions, but requested more time to consider the information presented. Indications were, however, that the town would submit the requested letter in support of nonstructural solutions.

g. Other Matters Considered: None.

DAVID C. HARRIS
Civil Engineer

The Town of Cheraw

Cheraw, S. C. 29520

June 13, 1979

Mr. Edwin Meredith
U. S. Army Engineer District, Charleston
Federal Building, P. O. Box 919
Corps of Engineers
Charleston, S. C. 29402

Dear Mr. Meredith:

We appreciate very much your visit to Cheraw and the first hand information regarding Section 205 of the 1948 Flood Control Act as Amended.

The Cheraw Town Council hereby requests an investegation of a prospective small flood control program under the above mentioned Section.

In reviewing the Local Cooperation section of the act we see no problem with the Town meeting the outlined requirements.

Our problem, as you are aware, is flooding at certain times along Wilson Branch. This occurs when the Pee Dee rises and/or excessive rainwater inflow into Wilson Branch. Water has been above floor level in certain homes in this area creating heavy expense and anxiety on the part of homeowners in the area.

Sincerely,

R. R. "Reg." Sipe
Administrator

RRS/ml

cc: Mr. Ben H. Whitstone Jr.
Engineering Division
State of S. C. Water Resources Commission
P. O. Box 4515
Columbia, S. C. 29240

Mrs. Charles Kudrna
Huckleberry Drive
Cheraw, S. C. 29520

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

Charleston District

APPENDIX 4

WILSON BRANCH

CHESTERFIELD COUNTY, S C

LOCAL COOPERATION AGREEMENT

APPENDIX 4

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LOCAL COOPERATION AGREEMENT

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APPENDIX 4

LOCAL COOPERATION AGREEMENT

PURPOSE

The purpose of this appendix is to present a draft copy of the local cooperation agreement required for project implementation. This document and supporting exhibits have been included in the feasibility report in an effort to expedite the review process and initiate project construction at the earliest feasible date. Subject documents will be signed following project authorization. The Town of Cheraw has previously indicated their intent to sponsor the Wilson Branch project and to provide the designated items of local cooperation. (See pertinent correspondence, Appendix 3).

AGREEMENT BETWEEN

THE UNITED STATES OF AMERICA

AND

THE TOWN OF CHERAW, SOUTH CAROLINA

FOR LOCAL COOPERATION AT

WILSON BRANCH, CHESTERFIELD COUNTY, SOUTH CAROLINA

THIS AGREEMENT, entered into this _____ day of _____, 19___, by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this agreement, and The Town of Cheraw, South Carolina (hereinafter called the "Town"), WITNESSETH THAT:

WHEREAS, construction of the Wilson Branch Flood Control Project (hereinafter called the "Project"), is authorized under authority of the Flood Control Act of 1948, approved 30 June 1948 (Public Law 858, 80th Congress, 2d Session, as amended); and

WHEREAS, the Town hereby represents that it has the authority and capability to furnish the non-Federal cooperation required by the Federal legislation authorizing the Project and by other applicable law.

NOW, THEREFORE, the parties agrees as follows:

1. The Town agrees that, upon notification that the Government will commence construction of the Wilson Branch Flood Control Project, substantially in accordance with Federal legislation authorizing such Project, the Flood Control Act of 1948 (Public Law 80-858, as amended), the Town shall, in consideration of the Government commencing such Project, fulfill the requirements of non-Federal cooperation specified in such legislation, to-wit:

a. Provide a cash or in-kind contribution equal to 20 percent of the Project first cost assigned to the flood damage prevention. Current estimates of the cost for the recommended alternatives is $73,770, which includes the local share of estimated relocation assistance cost;

EXHIBIT 4-1

b. Provide all government costs which exceed the statutory limitations of government participation;

c. Accomplish in accordance with the provisions of the authorizing document all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements made necessary by Project construction;

d. Hold and save the United States free from damages due to construction, operation and maintenance of the Project, provided damages are not due to the fault or negligence of the United States or its contractors;

e. Maintain and operate the Project after completion without cost to the Government, in accordance with regulations prescribed by the Secretary of the Army;

f. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to insure compatibility between future development and protection levels provided by the Project.

g. Comply with the provisions of Section 207, Public Law 91-646 and amendments thereto, (91st Congress, 1st Session, approved 2 January 1971), in arranging all required relocations and in acquiring all project-related real estate interests.

h. Furnish an assurance, Exhibit "A", attached hereto and by this reference made a part hereof, in compliance with Title VI of the Civil Rights Act of 1964 (78 Stat. 241), and Department of Defense Directive 5500.11 issued pursuant thereto, and published in Part 300 of Title 32, Code of Federal Regulations.

2. The Town hereby gives the Government a right to enter, at reasonable times and in a reasonable manner, upon land which it owns or controls, for access to the Project for the purpose of inspection, and for the purpose of operating, repairing, and maintaining the Project, if such inspection shows that the Town, for any reason is failing to repair and maintain the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the Mayor

of the Town of Cheraw.

No operation, repair and maintenance by the Government in such event shall operate to relieve the Town of responsibility to meet its obligations as set forth in paragraph 1 of the Argreement, or to preclude the Government from pursuing any other remedy at law or equity.

THE UNITED STATES OF AMERICA

By: _____
ROBERT K. HUGHES
Colonel, Corps of Engineers
Contracting Officer

THE TOWN OF CHERAW, SOUTH CAROLINA

By: _____
HOWARD E. DUVALL,JR., MAYOR

ATTEST: _____

ASSURANCE OF COMPLIANCE WITH THE DEPARTMENT OF DEFENSE DIRECTIVE UNDER TITLE VI OF THE CIVIL RIGHTS ACT OF 1964

THE TOWN OF CHERAW, SOUTH CAROLINA, (hereinafter called the Town) HEREBY AGREES THAT it will comply with Title VI of the Civil Rights Act of 1964 (Public Law 88-352, 78 Stat. 241) and all requirements imposed by or pursuant to the Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations, to the end that, in accordance with Title VI of that Act and the Directive, no person in the United States shall, on the ground of race, color, sex, or national originbe excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Town receives Federal financial assistance from the Department of the Army and HEREBY GIVES ASSURANCE THAT it will immediately take any measure to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Town by the Department of the Army, assurance shall obligate the Town, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the Federal financial assistance is extended or for another purpose involving the provisions of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Town for the period during which the Federal financial assistance is extended to it by the Department of the Army.

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts, or other Federal financial assistance which were approved before such date. The Town recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Town, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the Town.

Date:_____ By:_____
HOWARD E. DUVALL, JR.
Mayor
THE TOWN OF CHERAW, SC

Attest:

Date:_____ By:_____

EXHIBIT "A"

EXHIBIT 4-2

CERTIFICATE OF AUTHORITY

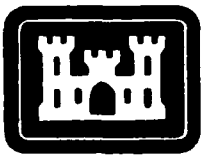
I, _____, do hereby certify that I am Attorney for THE TOWN OF CHERAW, SOUTH CAROLINA: that The Town of Cheraw, South Carolina is a legally constituted public body with full authority and legal capability to perform the terms of the agreement between The United States of America and The Town of Cheraw, South Carolina in connection with the Wilson Branch Flood Control Project, and to pay damages, if necessary, in the event of the failure to perform in accordance with Section 221 of Public Law 91-611 and that the person who has executed the contract on behalf of The Town of Cheraw, South Carolina, has acted within his statutory authority.

IN WITNESS WHEREOF, I have made and executed this Certificate, this _____ day of _____, 1982.

_____

Attorney, The Town of Cheraw, SC

EXHIBIT 4-3



US Army Corps of Engineers

Charleston District

END

DATE
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